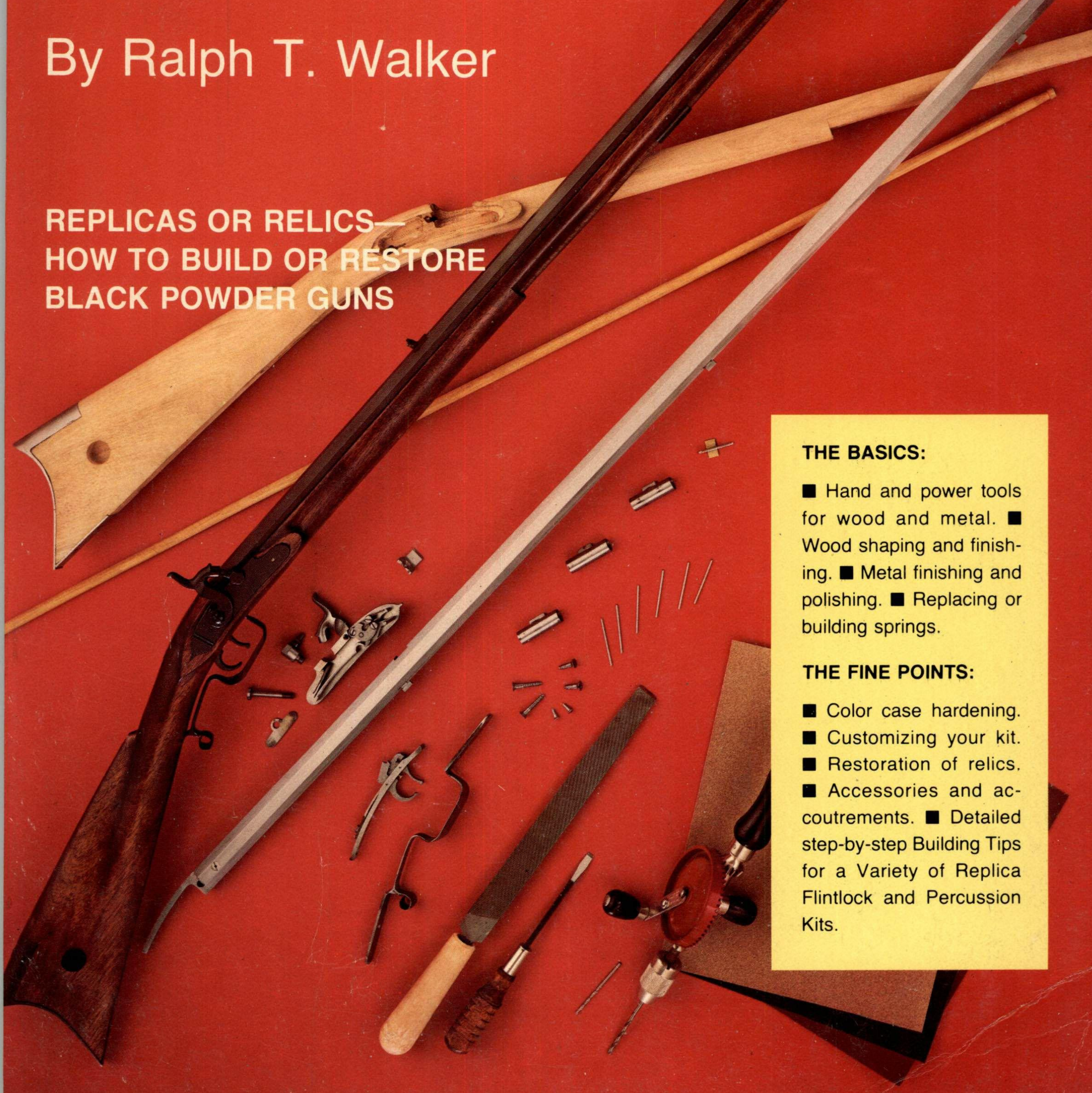
Seven Dollars and Ninety-Five Cents

# BLACK POWDER GUNSMITHING

By Ralph T. Walker



**REPLICAS OR RELICS—
HOW TO BUILD OR RESTORE
BLACK POWDER GUNS**

**THE BASICS:**

■ Hand and power tools for wood and metal. ■ Wood shaping and finishing. ■ Metal finishing and polishing. ■ Replacing or building springs.

**THE FINE POINTS:**

■ Color case hardening. ■ Customizing your kit. ■ Restoration of relics. ■ Accessories and accoutrements. ■ Detailed step-by-step Building Tips for a Variety of Replica Flintlock and Percussion Kits.

# THE AUTHOR

*Ralph Thomas Walker was born at Selma, Alabama, in 1931. The Walker family had settled in Selma in 1821 and a great-great grandfather of Ralph's served as a sniper with the Confederate Army in the War Between the States. His grandfather, Franklin R. Walker, was a well-known local gunsmith who taught the present author skills and secrets of the trade while the latter still was in knee britches.*

*Walker attended Trinidad State Junior College, graduating with an AA degree in gunsmithing. P.O. Ackley was chief instructor and Walker worked part-time in the Ackley shop before enlisting in the army in July 1951.*

*He took basic training and attended NCO school at Fort Jackson, South Carolina, going on to graduate from OCS at Aberdeen Proving Grounds, Maryland. Further specialist schools from which he graduated included Small Arms Maintenance, Enemy Arms and Material, Explosive Ordnance Demolition and Military Attache. Ordered to Formosa, Walker served as senior small-arms advisor to the Nationalist Chinese Ordnance Corps, setting up their small arms rebuilding facilities and assisting in the design and production of two Chinese small arms: the submachine gun and sniper rifle. He saw combat on Taichen and Quemoy while serving as small-arms adviser to irregular guerrilla troops and received a commendation from Nationalist China. Returning to the USA, he served as commanding officer of the 95th Ordnance Company at Camp Stewart, Georgia, until leaving the service in 1955.*

*In civilian life, Walker started a small backyard gunsmithing operation, but quickly outgrew its facilities. He moved to the location of his present shop in Selma and incorporated his activities in 1971.*

*Walker commenced writing for the firearms press some years ago and has been writing for GUN WORLD Magazine since 1970.*

# BLACK POWDER GUNSMITHING

by

Ralph T. Walker

DBI BOOKS, INC., NORTHFIELD, ILLINOIS

**ON THE COVER**
*Dixie Gun Works reproduction of the classic Tennessee Mountain Rifle is illustrated in assembled and disassembled form. Available in percussion and flintlock versions, it is not a replica; rather, it is an actual reproduction of the extremely distinct mountain rifle that was developed and literally handmade by Tennessee gunsmiths beginning in the early 1800s.*

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# Dedication

To my father, Frank M. Walker, who left the gunsmithing profession as a young man and returned after retirement. Honor, integrity and determination were not words to him, they were a way of life.

To my mother, Lula G. Walker, who from the day I was born has been a constant source of strength and inspiration. She shares my success with pride and my failures with encouragement to try again.

### CHAPTER 1

# INTRODUCTION TO BLACK POWDER

## Some Historical And Contemporary Notes On Black Powder And Muzzleloaders

MOST MODERN BLACK POWDER gun buffs under the age of 45-50 have the impression that the current interest in black powder is a re-creation of something ancient. Nothing could be further from the truth.

No one has ever fully documented the invention of black powder, but most historians agree that the roar and fire began about the year 1200 and continued in ever-growing intensity for the next seven centuries. When France introduced the Poudre-B powder in the Model 1886 Lebel rifle in 1890, that began the true smokeless powder age Poudre-B was a true, gelatinized nitrocellulose powder. In the United States, the first true smokeless powder was the W-A and Lightning used in the Model 1899 Krag rifle.

There had been numerous attempts to produce a smokeless powder prior to this, but all fell short of the desired goal. The best of black powder gave around thirty foot-pounds of energy per grain. The early, true smokeless gave fifty-four foot-pounds of energy per grain in the same rifles and same bullet weights. It is easy to see why *Black Powder Only* is so important in shooting guns designed for black powder; even more so with the much more efficient, modern smokeless powders.

With the introduction of true smokeless powder, there was no overnight dumping of black powder guns into the local pond and mad rushes to the nearest gun dealer. Ammunition manufacturers continued to produce cartridges and shotgun shells with black powder loadings well up into the mid-1930s, as well as loose black powder in the can; along with numerous brands of semismokeless and bulk smokeless for the hundreds of thousands of black powder guns owned by consumers.

One would think that after forty years black powder guns would be consigned to the back of the closet or hung on the wall as a memento. One key factor prevented this: the Depression years.

Today, we think nothing of paying a dollar for a hamburger, and it is difficult to realize that during the Depression years men stood in long lines for jobs that paid 50 cents and $1 per day! Wages increased somewhat as the 1930s drew to an end, but consider that a box of fifty .22 long rifle cartridges sold for fifty cents, a box of twenty .30-30s for $1.50, and a box of twenty-five shotgun shells for $1.75! At the same time, a one-pound can of Du Pont black powder sold for $1 and 1000 percussion caps for $1.45!

With 7000 grains of powder to the pound, it is easy to understand the economics involved in continuing to use black powder, both in muzzleloaders and hand-loaded brass cases for rifle and shotgun breechloaders. Primers for center-fire rifles and shotgun shells cost $2 for five hundred, and shot in all sizes sold for ninety-five cents for a five-pound bag.

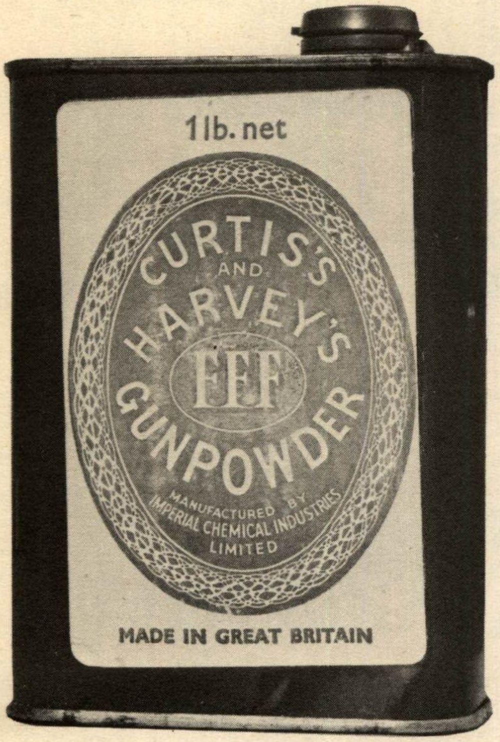
Just as the United States was pulling out of the Depression years, along came World War II in the 1939-1941 era. Almost overnight all arms and ammunition manufacturers were changed over to meet military demands. Sporting arms and ammunition production fell almost to zero. As the smokeless powder ammunition supply rapidly decreased on dealer shelves, only black powder components remained in any quantity.

Just as smokeless powder guns were rapidly replacing the old black powder firearms, and black powder components were beginning to gather dust on dealers' shelves, the war gave black powder another five years of life. The old guns

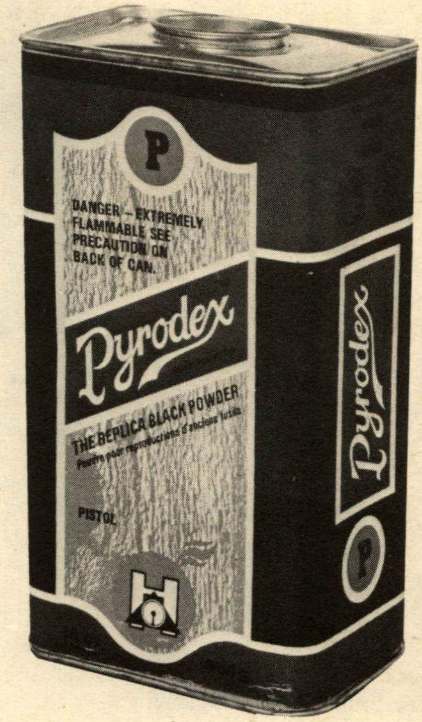
poured into gunsmith shops for restoration, and dealers dusted off the cans of black powder and searched their storeroom back shelves.

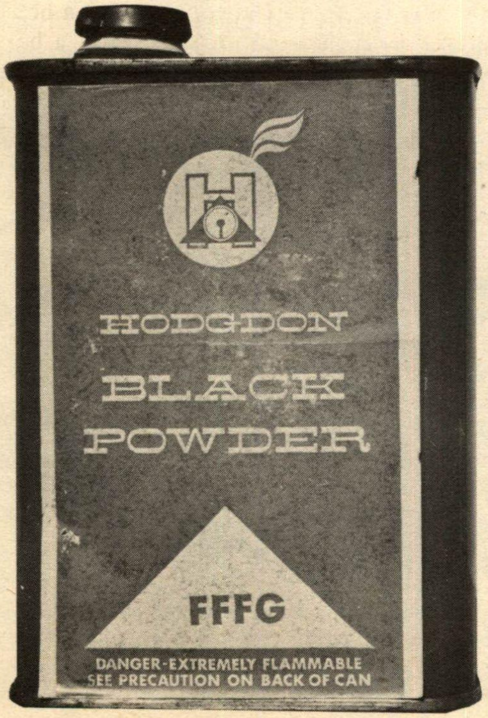
For the general public, the half-decade after the war was the low point for black powder guns and components.

Not all of the public turned their backs to the muzzleloader and black powder guns. Francis Bannerman of New York had been in business for many years, filling any order in their catalog from a 5½-acre island in the Hudson River filled with surplus military arms and ammunition dating back to 1865. Turner Kirkland of Dixie Gun Works placed his first ad in May 1948 and, in 1955,

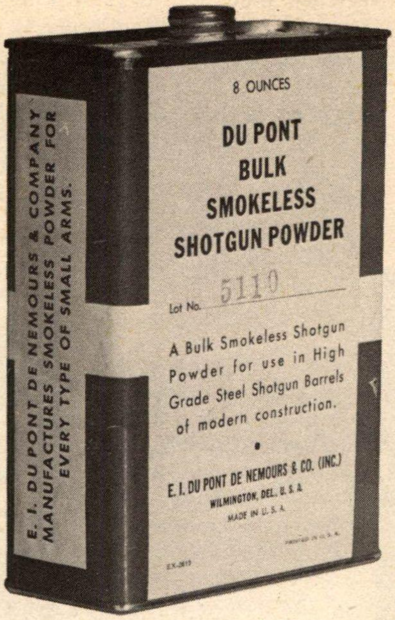



*Obtaining supplies of good black powder is a problem in different times and places. The British-made powder at left has been a big help in eking out the domestic supply. At right, Pyrodex, here in P (for Pistol) grade, is a modern propellant designed for use in muzzleloaders but its production has been interrupted until a new plant can be built to replace the original one destroyed by a tragic flare in 1977.*



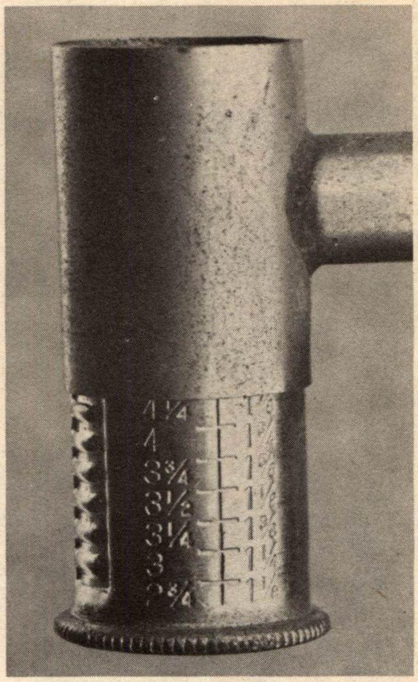




*The FFFg grade of black powder, such as the can of Hodgdon's at left and Gearhart-Owen at right, are about the same as the grade P Pyrodex above. Gearhart-Owen is made at Moosic, Pennsylvania, at the site of the plant where Du Pont made black powder for well over a century.*

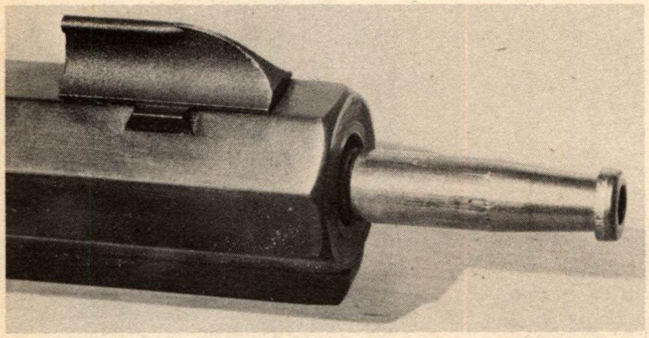

*A pre-WWII can of Du Pont Bulk Smokeless powder for shotguns. It contained a filler so that it could be dipped bulk-for-bulk in place of black powder. As noted on the back label, it was not suited for use in shotguns with Damascus barrels.*

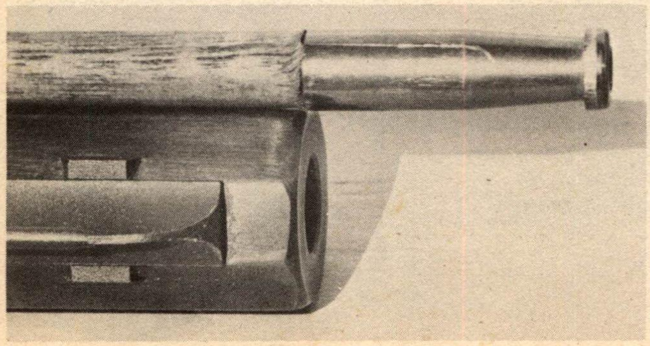
*Dipper-type measures such as this were used for dispensing powder by the dram and shot by the ounce for muzzleloading shotguns. The dippers were easily adjustable.*

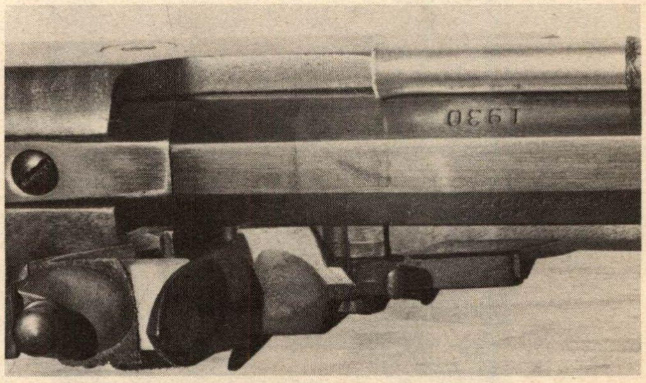



introduced the first reproduction muzzleloading rifle in the country. Val Forgett of Navy Arms Company followed in 1958 with a replica of the Model 1851 Colt revolver. The black powder reproduction-replica age began its current steady growth with no end in sight.

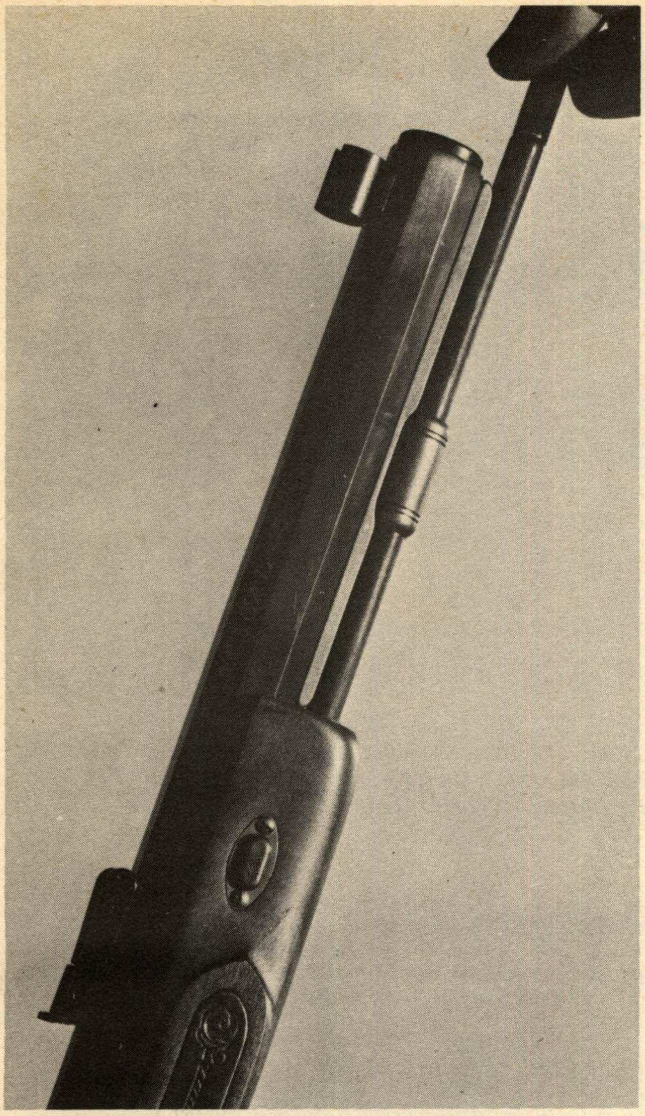
So far we have discussed only the general public, but what about the collectors and gun buffs? In February of 1931, E.M. Farris and Oscar Seth of Portsmouth, Ohio, held a muzzleloaders-only match with sixty-seven shooters participating. This group joined with others in 1935 to form the National Muzzle Loading Rifle Association. In 1938 a range was established at Friendship, Indiana, with both a spring match and the big fall match. The NMLRA



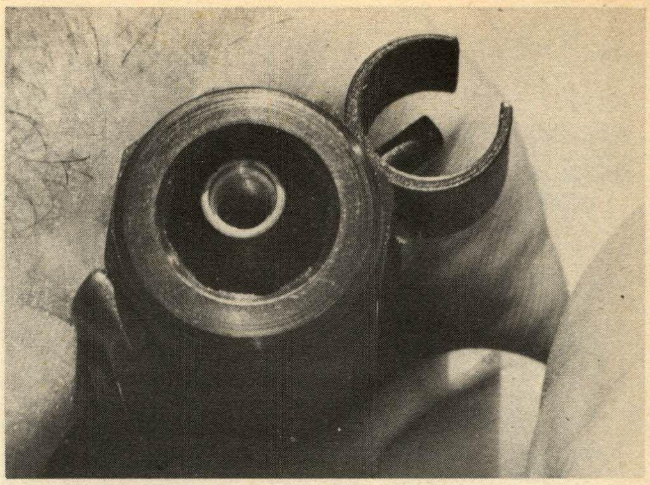




*As discussed here, the ramrod can be used to check for loaded guns by running it down bore, marking the place and laying it alongside the barrel to indicate extent of clear bore area as shown in these photos.*



*Withdrawing the ramrod from the Thompson/Center Patriot pistol in preparation for checking the bore.*

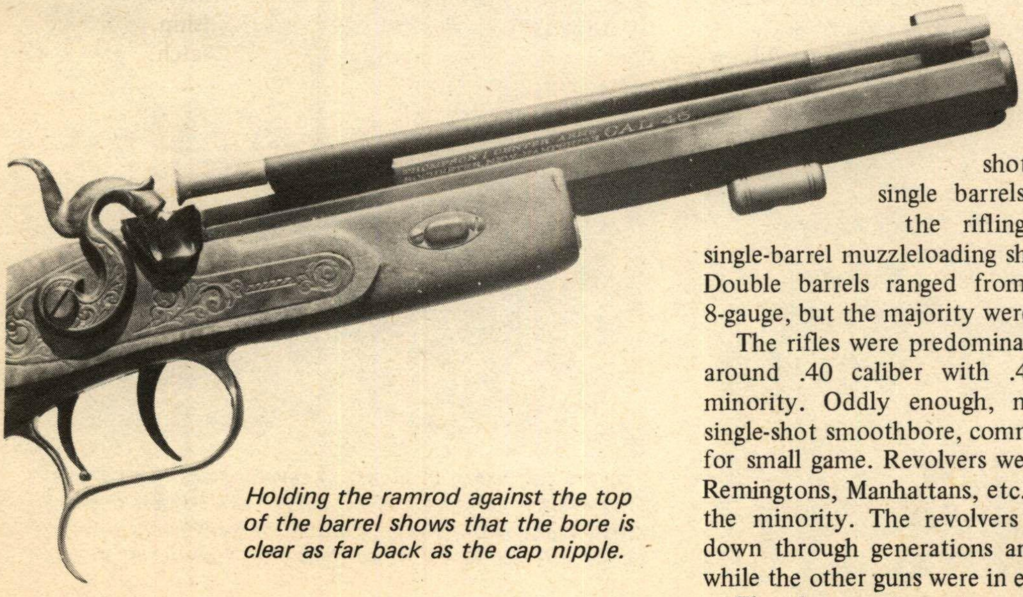


*Facing page shows checking procedure for flintlock rifle and same steps are illustrated here for this percussion Thompson/Center Patriot pistol. Above, ramrod goes into the bore to its entire length when bore is empty.*

membership has grown each year, and the pistol, rifle and shotgun matches attract crowds of over 2000, not including the five hundred-plus participating shooters.

The collectors? They have always been around, both collecting and shooting black powder guns. The low-tide era of the mid-1940s to 1950s often are referred to by collectors as the Golden Years. Percussion military rifles in mint condition were available for $5 or less; percussion revolvers and rifles seldom sold for over $10; shotguns even less. The gun shows and ever-increasing number of collectors, however, soon pushed the prices up until only the rich could accumulate a top-notch collection. Each year the prices for originals has resulted in fewer being shot and used, which results in the rapid growth of the reproduction-replica guns.

My grandfather, Franklin Riley Walker, was a well-known gunsmith in central Alabama from around 1900 to 1945. My boyhood days in the 1930s, early 1940s were spent as an apprentice in his shop. Black powder guns were as common as a pump shotgun is in today's gunsmith shops. Many were black powder breechloaders. The others primarily were single and double-barrel muzzleloading shotguns. The majority of the single barrels were old muskets with the rifling bored out, true sporting single-barrel muzzleloading shotguns being in the minority. Double barrels ranged from 16-gauge up to a few big 8-gauge, but the majority were 10-gauge.



*Holding the ramrod against the top of the barrel shows that the bore is clear as far back as the cap nipple.*

The rifles were predominantly .32 and .36 caliber, some around .40 caliber with .45 caliber and larger in the minority. Oddly enough, most of the handguns were single-shot smoothbore, commonly used with a load of shot for small game. Revolvers were generally .36 caliber Colts, Remingtons, Manhattans, etc. Those in .32 and .44 were in the minority. The revolvers generally were guns handed down through generations and used for home protection, while the other guns were in everyday sporting use.

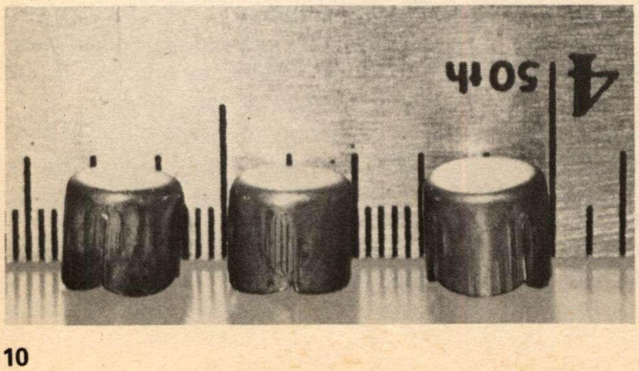
The shop equipment consisted predominantly of hand

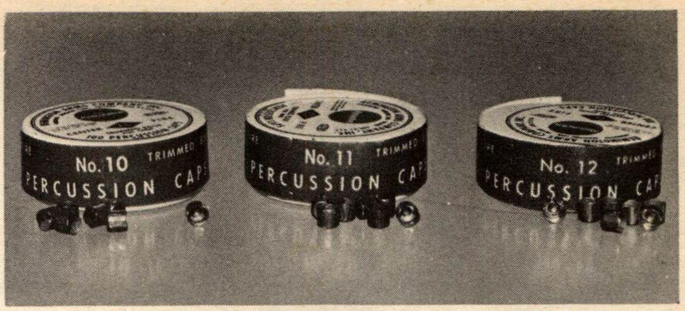

*Remington Arms Company continues to produce caps for percussion muzzleloaders in three sizes shown here.*

tools, usually homemade from worn-out files, etc. The drill press was turned by hand, the lathe foot-pedaled and all welding was via the forge and hammer welding. If a part was not available, a suitable piece of scrap metal was selected, forged to rough shape and hours of patient filing to final shape. Few gunsmiths today can match the filing skills of one of the old-time masters.

It is difficult to convince a modern beginner that a big, expensive, well-equipped machine shop is not necessary for gunsmithing. A good set of hand tools and patience, plus a little sweat, is really all that is essential. Even many of the hand tools can be made from scrap.

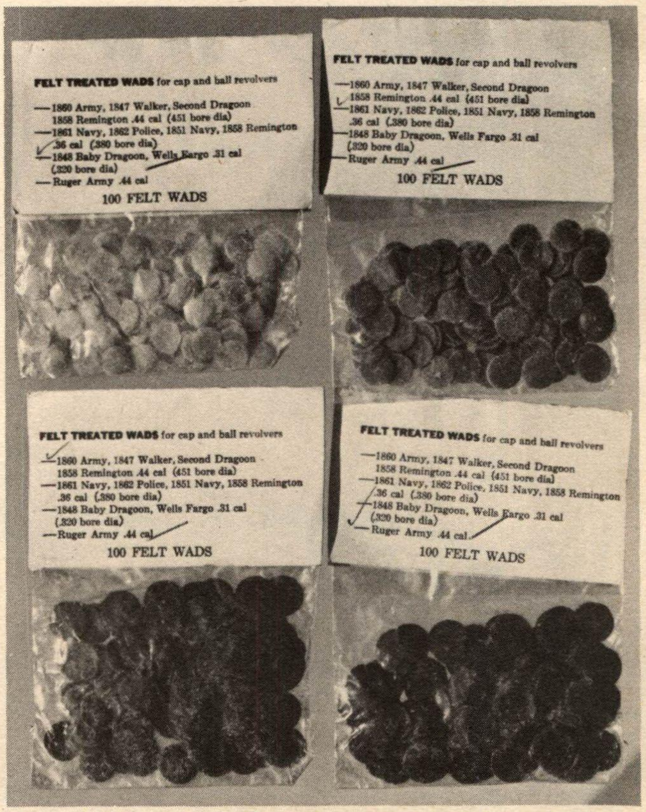
*Left to right, Remington's Nos. 10, 11 and 12 caps differ but little in size, but correct choice is important to assure the cap stays on nipple with a friction fit.*







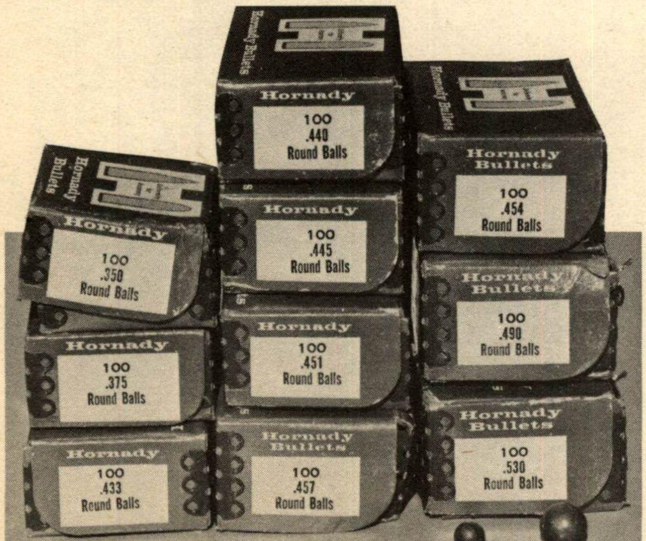
*Since the Nos. 10, 11 and 12 Remington caps are identified only by the sealing tape that is removed in opening the tins, it's a good idea to mark the number on the bottom of the container with a felt marker.*



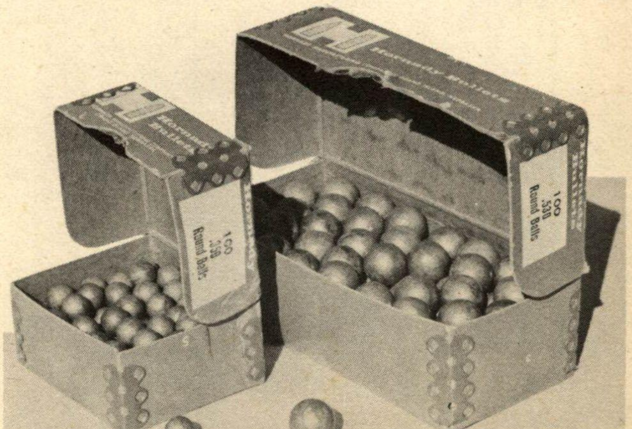

*Treated felt wads, available in several sizes from Dixie Gun Works, Union City, Tennessee, are loaded between powder and projectile in cap and ball revolvers to avoid danger of setting off more than one chamber at a time.*

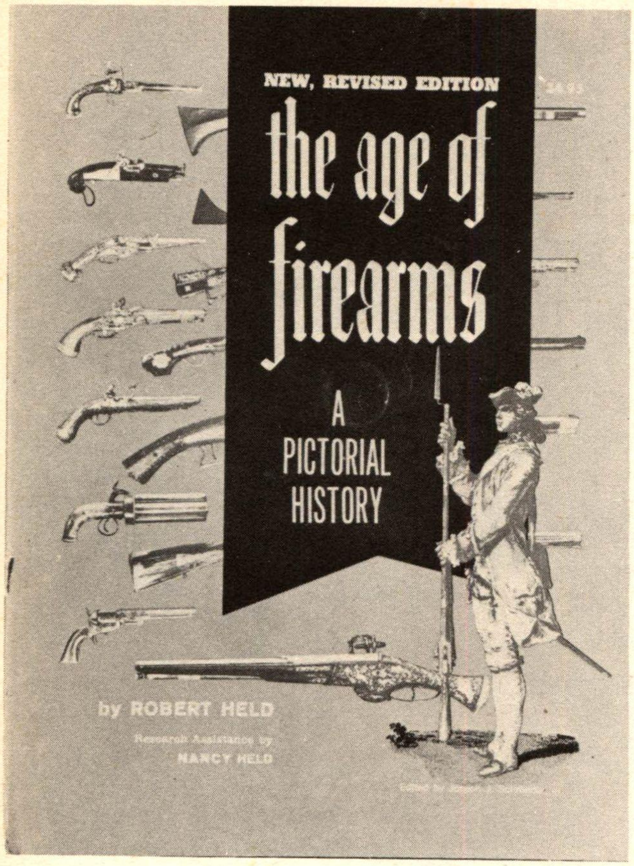

*Percussion caps, available from several sources in tins of one hundred, are essential for firing guns such as the T/C Patriot.*

*For the black powder shooter who does not wish to bother with moulds and melting pots, Hornady Manufacturing Company, Grand Island, Nebraska, offers round lead balls in ten diameters from .350 to .530-inch in cartons of 100.*



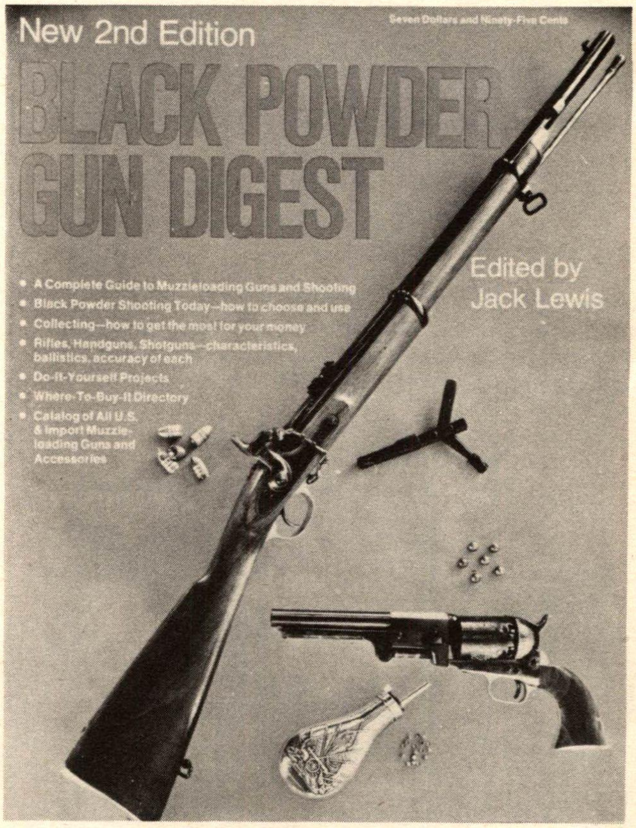

*The Hornady lead balls are put through a special process to make them perfectly spherical, with no sprues to cause erratic flight, resulting in an exceptionally accurate bullet.*

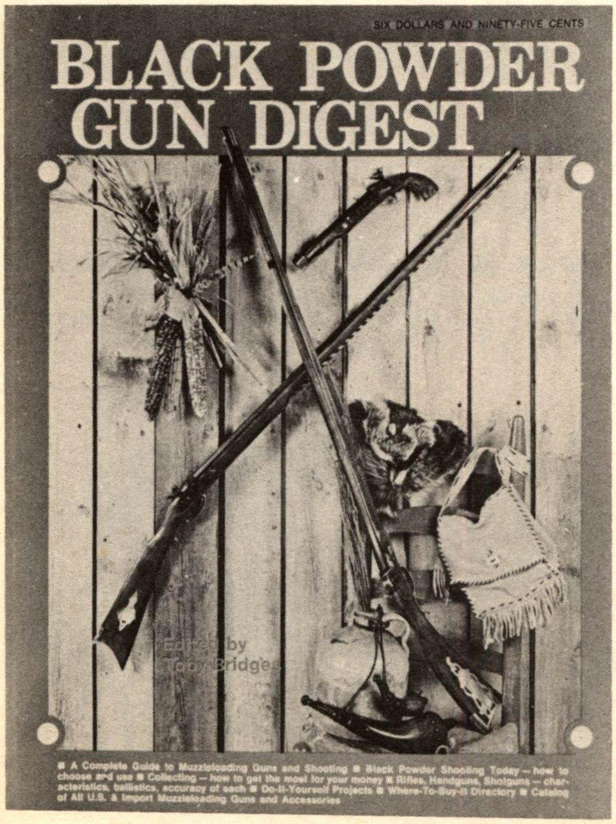


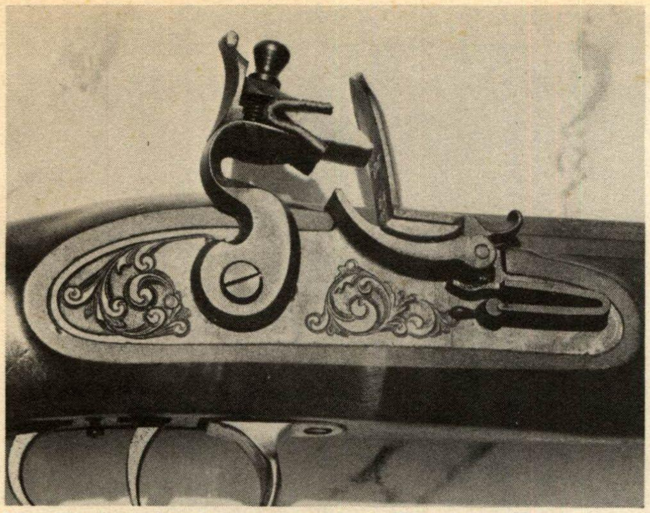



The over seven centuries of black powder development, and the step-by-step improvements of firearms to use it, is a fascinating story. Anyone using muzzleloaders and black powder will enjoy their sport more if they know the history of black powder guns. There are numerous books available, but I personally consider *The Age of Firearms* (revised edition) by Robert Held, published by DBI Books, Inc., the most authentic and thoroughly researched. The first and second editions of *Black Powder Gun Digest* edited by Jack Lewis, also published by DBI, contain a wealth of useful data and information on everyday use as well as history by several writers.

All is not gold that glitters and all powder, black in



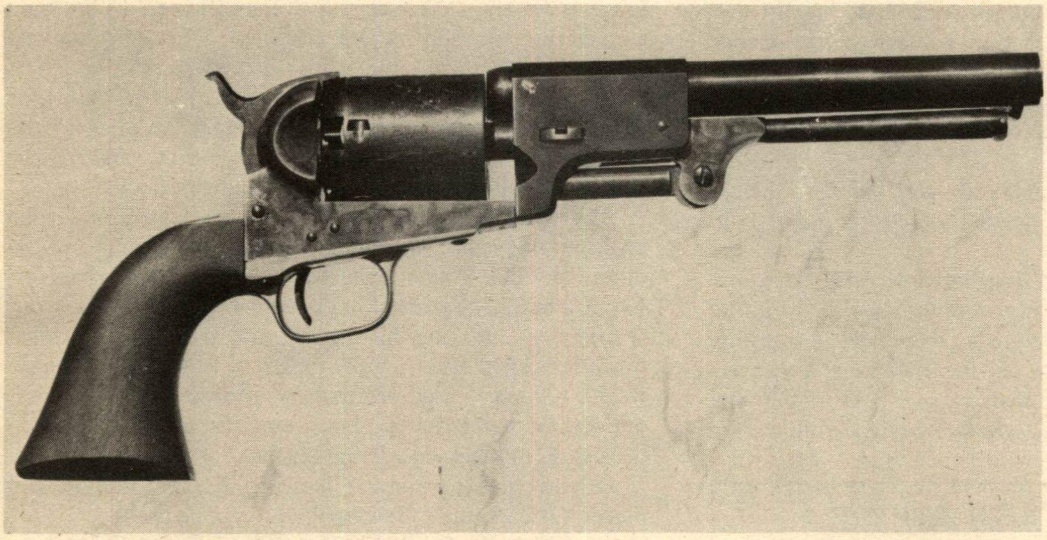





*The flintlock, here represented by a Thompson/Center caliber .45 Hawken, holds a piece of flint in its striker and, when fired, scrapes sparks from the pivoting frizzen into powder in the pan to set off charge of powder in bore.*

color, is not *black powder.* This is the number one rule in using black powder guns and working on them, either as a hobby or professionally. Every year good guns are destroyed and people are injured by violating the number one rule. Black powder guns are as safe as any mechanical device, provided you use common sense. As an example, people lose feet, hands, etc., each year mowing their lawns by completely ignoring the safety warning plainly printed in the operating instructions – and even written on the power mower itself!

Current black powder varies somewhat in the three basic component percentages, but usually is seventy-five percent saltpeter, fifteen percent charcoal and ten percent sulfur. Saltpeter is sometimes referred to as potassium nitrate or niter. Basically, black powder manufacture consists of mixing the components with water to form a paste, then pressing the paste through holes to form long cordlike ropes. When dry, it is crushed by rolling and stamping machines to break it into small pieces. The pieces are then sifted through a series of increasingly smaller screens to separate the various sized pieces. When first produced this



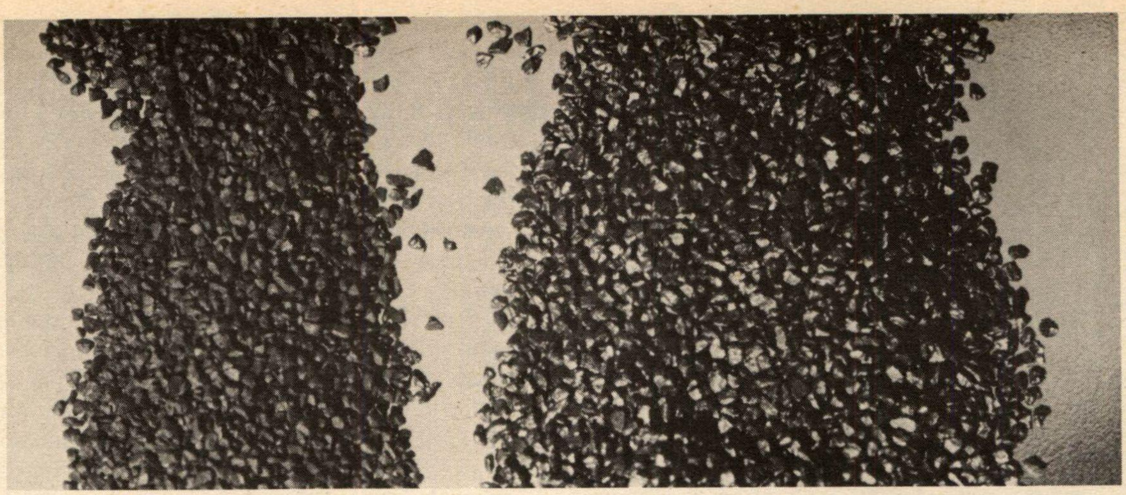
*Cap & ball revolvers, such as this Colt 3d Model Dragoon, are another basic black powder design. The Colt works, a few years ago, made a limited run of their 3d Model Dragoon, resuming serial numbers at the point when production stopped about 1860.*

*Single-shot percussion pistols and rifles, such as this Thompson/Center Patriot, may be fitted with set triggers to ease the weight of pull for better accuracy.*

way, the largest pieces were about the size of a grain of corn and were called Corned Powder. Previously, the three ingredients were loose and simply mixed together dry, producing a form of black powder known as Serpentine Powder.

There have been numerous terms used over the years for determining grain size, such as pebble, pellet, mealed, waffle, fine, super fine and on and on, all resulting in utter confusion. The confusion began to end with the adoption of a system using the letter G for grain with another letter preceding the G. The beginner may encounter the designated AG or simply A. This is black powder designed for blasting and is never used in firearms. The designation LG (large grain) and RLG (rifle large grain) are obsolete and such powder should not be used.

Another source of black powder that should never be used is powder recovered from old artillery shells. Remember that its purpose was to explode the shell! It usually consists of other added ingredients that may or may not turn your favorite smokepole into the equivalent of a hand grenade. I know of one individual who dumped the powder from such a recovered shell on his back lawn to let




*The difference in granule size between the different grades of black powder is not readily apparent by examination. Here, somewhat larger than life-size, are FFFg (left) and FFg for easy comparison.*

the sun dry it out. It started smoking and, luckily, he departed hastily from that section of real estate. A few minutes passed and then a large boom occurred. The only damage was a big hole in his lawn, scorched grass, some broken glass in his house, and a thoroughly embarrassed individual.

In short, play it safe and stay with modern black powder, with the appropriate designation clearly marked on the container.

Modern black powder is designated by one or more capital Fs, followed by a lower-case letter g or – quite rarely – r. That is true of the grades employed in sporting arms. The more Fs, the smaller the individual granules. Particulars on this system appear on page 137 of the late Phil Sharpe's *Complete Guide to Handloading* as follows:

| POWDER | SCREEN MESH SIZE | |
|---|---|---|
| Size | Must Pass | Must Not Pass |
| Fg | 14 | 10 |
| FFg | 16 | 24 |
| FFFg | 24 | 46 |
| FFFFg | 46 | 60 |
| FFFFFg | 60 | – |

The figures represent the number of meshes per running inch of the screens used to sift powder into the various grades. In normal use, only the sizes Fg through FFFFg are encountered. The suffix letter g stands for glazed, denoting that the granules have been tumbled with finely ground graphite to coat them. Uncoated powder was designated Fr, FFr, and so on, with the r standing for rough; but it is not apt to be encountered by the modern muzzleloading buff.

In vocal references to the different grades, common usage is to say, "three-eff," or "four-eff-gee," rather than enunciating the appropriate number of Fs. The coarsest grade, Fg, is used in large caliber rifles, large bore shotguns and scale model cannon. FFg is used in rifles and shotguns of about caliber .50 and larger. FFFg is for the smaller rifles and handguns. FFFFg is used in handguns of caliber .31 or smaller as well as for priming the pans of flintlocks.

Black powder is sold and measured by weight under the avoirdupois system. One pound equals sixteen ounces, 256 drams or 7000 grains; one ounce equals sixteen drams or 437.5 grains. The term dram derives from the Greek word *drachme* – meaning handful – and used to be spelled drachm, with the same pronunciation. In the apothecaries' weight system – used primarily by pharmacists – a dram is one-eighth ounce, or 60 grains, but this does not apply to discussion of black powder and its use.

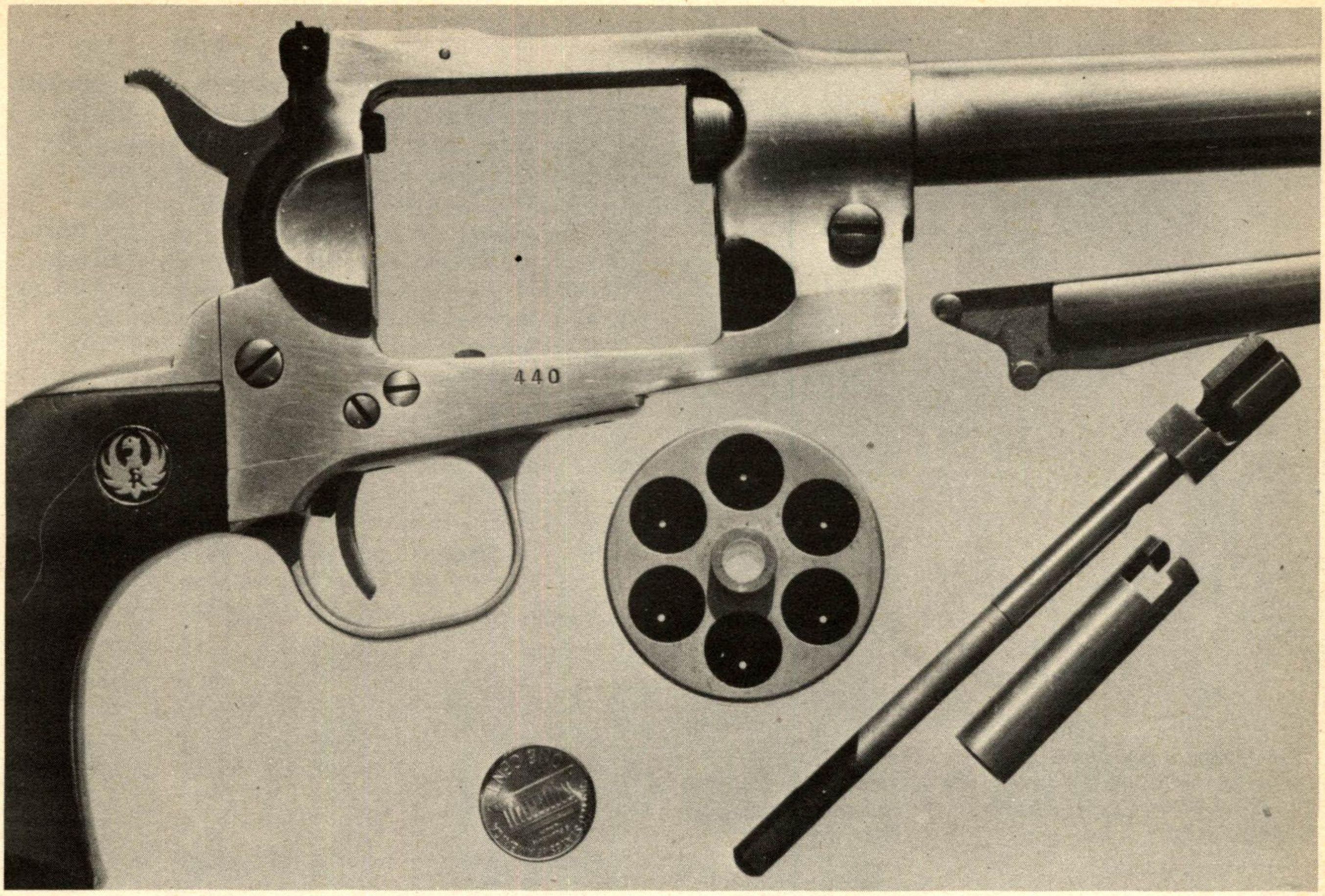
If you wish to convert between the avoirdupois and metric systems, the following factors can be used:

pounds times 0.4535924 equals kilograms (kg.)
ounces times 28.349527 equals grams (g.)
drams times 1.7718454 equals grams
grains times 0.0647989 equals grams
kilograms times 2.2046224 equals pounds (lbs.)
grams times 0.0352739 equals ounces (oz.)
grams times 0.5643824 equals drams (dr.)
grams times 15.43236 equals grains (gr.)

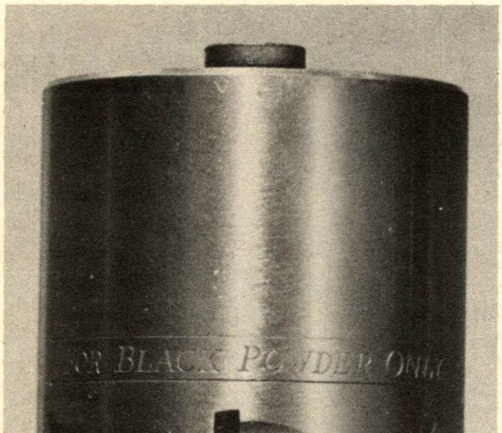
What is the correct load for a muzzleloading rifle? There are numerous old, supposedly surefire methods based purely on guess. Like any other firearm, each gun will give different results, hence there is no set formula. The best method is to use the lightest load that produces the best accuracy in each gun. But, you must have a starting point. The best starting formula is 1 grain of powder for each caliber, for example 50.0 grains of powder for a .50 caliber rifle. Work up 2 grains at a time until the best accuracy is achieved. This is with a round ball projectile.

For conical projectiles, start at a powder weight equaling twenty-five-percent of the weight of the projectile. Again, work up 2 grains at a time until best accuracy is achieved. The same basic procedure can be used for handguns.

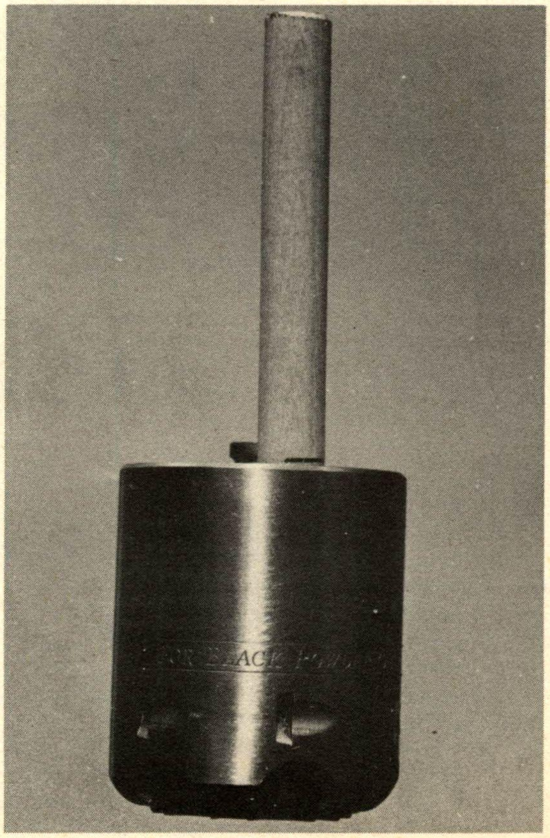
Shotguns are somewhat easier. Note the words "3 Drams




*Ruger's caliber .44 Old Army Model, here in its eminently practical stainless steel version, can be disassembled readily with a coin. View down through the chambers assures that the flash holes are clear. As text discusses, looking into the chambers is not a good way to verify empty state. An unsuspected charge, set off in disassembled cylinder, can still be quite dangerous.*



*Above, cylinder of the Ruger Old Army is clearly engraved with warning, "For Black Powder Only." Right, using a short length of marked wooden dowel to check for load.*

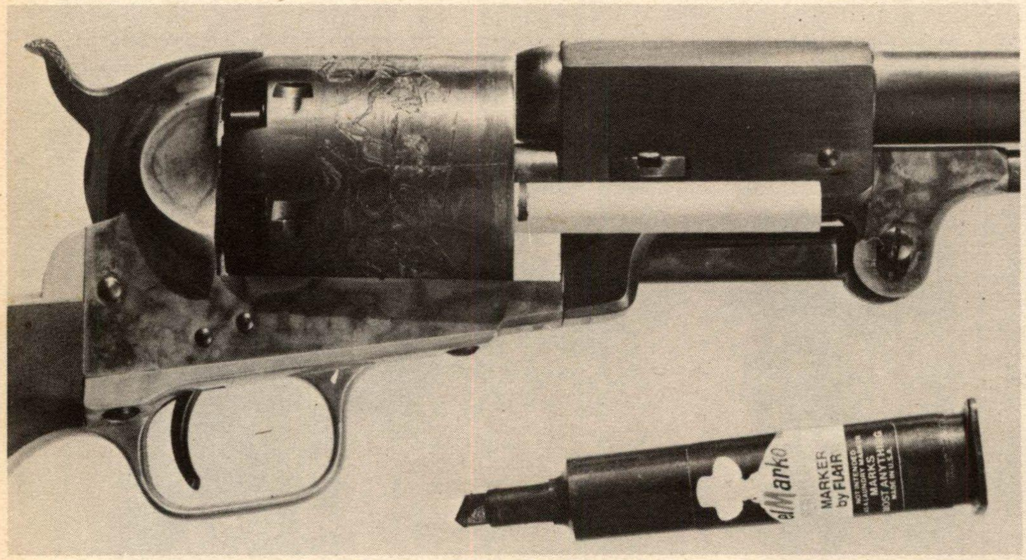


Equivalent" on, say, a box of modern, light loads with 1-1/8 ounces of shot in 12 gauge. The drams-equivalent is a holdover from black powder shells and is used today to designate the power of the shell. Once you know the gauge of the shotgun, select the lightest load and follow the drams-equivalent using this figure for your black powder load. Avoid the modern magnum loads that simply state "maximum" with a heavy shot load. As a rule of thumb, the best patterns are achieved with light loads of powder.

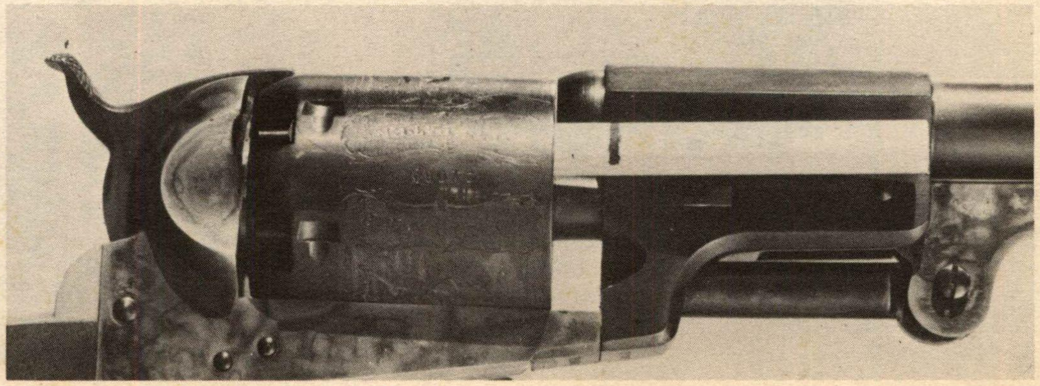
There are numerous books on the loading of the various types of muzzleloaders and available projectiles. If you remember that a muzzleloader is the earliest form of handloading, it is only sound judgment to purchase a good black powder manual. This is especially true for the transitional black powder guns that used some form of fixed loads or cartridges.

In black powder gunsmithing, the cardinal rule of considering every gun loaded is even more important than in modern firearms. Every muzzleloading rifle and shotgun

*Visible in above photo are the safety notches between the nipples on the Ruger Old Army. The cylinder can be set so as to lower the nose of the hammer into one of the notches for safety in carrying the gun in holster, ready for action.*




*A short piece of 3/8" dowel has been inserted into an empty chamber of 3d Model Colt Dragoon and marked with felt-tipped pen to serve as a chamber checker plug.*



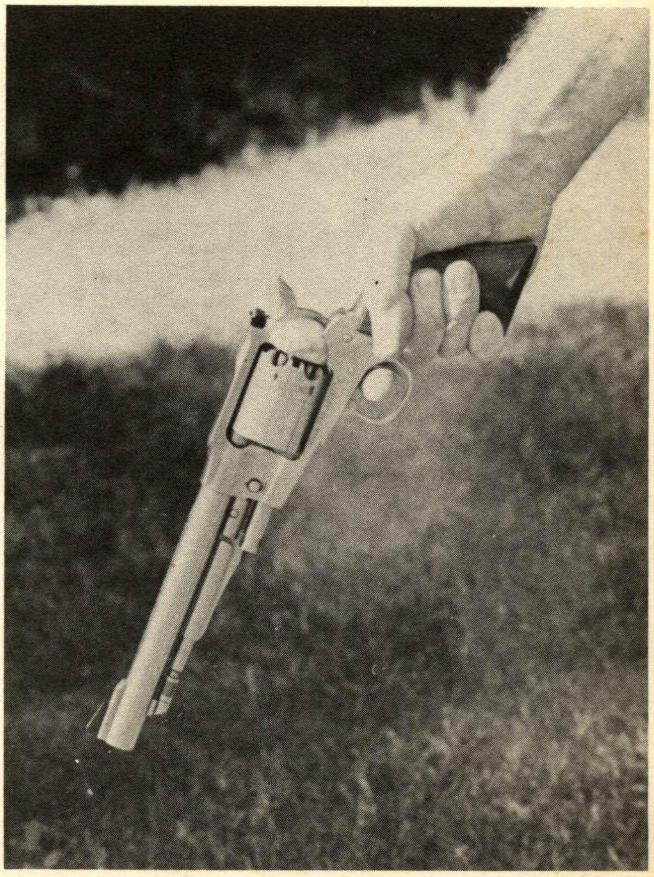
*If the marked dowel goes into the chamber only part way to the mark, it indicates that a quantity of powder may be present, necessitating that appropriate steps be taken.*


*Lee Precision, located in Hartford, Wisconsin, makes a wide variety of bullet moulds for easy home production of round balls and conical projectiles for use in black powder guns. This two-cavity mould is for their "Rifling Engraved At Loading" (REAL) bullet, available in popular diameters.*

should be checked with the ramrod or a long, wooden dowel. Insert the dowel down the bore with your fingers until it stops. Mark the rod or dowel with a felt-tip pen or pencil flush with the muzzle. Remove the rod or dowel, lay it beside the barrel and align your mark with the muzzle. Note the other end and how close it comes to the breech end of the barrel. A full or partial load will be evident.

Revolvers can be checked for loads just by looking down the chambers? *Wrong!* Anyone looking down the bore or a chamber to see if a gun is loaded has a few screws loose in his brain department. While you can check by looking at a side angle, it is not a thorough inspection as a partial load may be lurking in the shadows. A short, wood dowel slightly smaller in diameter than the chamber should be inserted in each chamber and checked for depth as previously outlined.

Even with this safety inspection it is not absolutely certain that the gun does not contain a partial load. Old



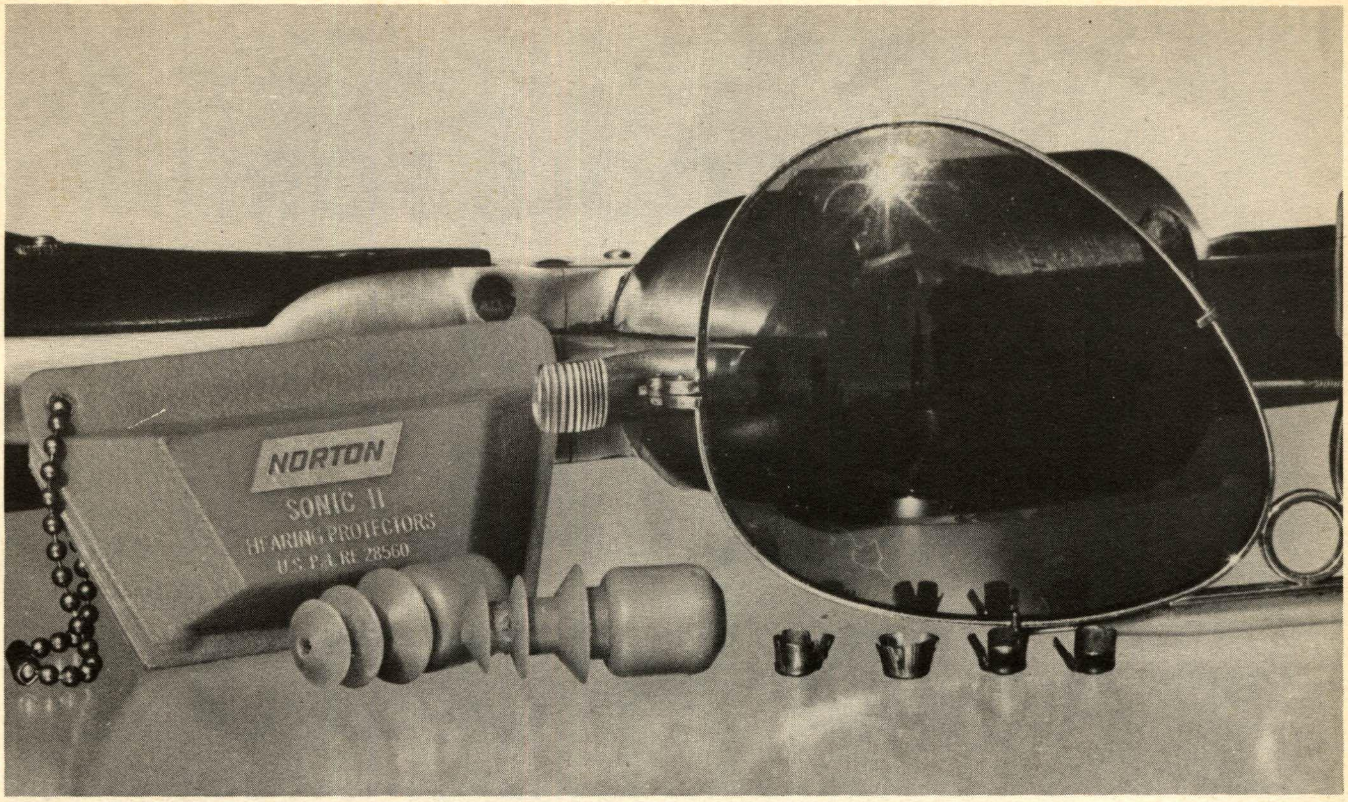
*As discussed here, it's common procedure to place a cap on each nipple, point the muzzle in a safe direction and snap one cap on each empty chamber before loading up.*


*Gasoline and alcohol are a dangerous pair to mix and that is at least equally true of black powder and burning tobacco. Every possible precaution must be taken against fire hazards when working with black powder firearms.*


*The notices on current Gearhart-Owen cans are relevant.*

black powder has a habit of becoming wet, then caking and rehardening around the chamber walls. After making the previously described inspection, plus checking the nipple or touch hole for clearance, I make one final test. On percussion guns a new cap is placed on each nipple and fired – this is accomplished twice. The same procedure is followed with flintlocks. Ample time is allowed between each test as the old, caked powder may smolder before igniting. Now remove the nipple(s) and pour hot water


*Just because it's powder, just because it's black, doesn't necessarily mean it's "black powder" and suitable for use in muzzleloaders. The Hercules Bullseye smokeless at right resembles black powder closely in appearance, but it would be very dangerous if used in a muzzleloader.*



*The thin copper skirts of percussion caps tend to disintegrate upon being fired and the fragments can be a serious danger to the eyes. Accordingly, shooting glasses with hardened lenses, such as the Bausch & Lomb pair here – distinguished by the small circle between lenses – should be worn whenever shooting black powder guns. Ear protection is just as important.*

down the bore to loosen old residue and thoroughly soak any remaining caked powder. Then and then only can you consider the gun unloaded and safe to commence repairing.

The next safety rule is that a brass or bronze metal rod is required to clean out the bore. Never use steel, as the steel rod and steel barrel can create a spark and ignite any powder residue.

A good example involved a friend of mine who was cleaning out a double-barrel shotgun. He made the usual correct check with the ramrod and fired two percussion caps, however, there was still some residue at the rear of the barrel. He had not used the soaking hot water and was trying to remove the deposit with a sharp-edged steel rod, bounding the rod down the bore.

Before I could warn him, there was a loud bang. The nipple was out, but the explosion was sufficient to propel the steel rod across the room and bounce it off the wall. Luckily, only his thumb was partially in front of the muzzle and he escaped serious injury, although for a few days his thumb looked like it had been tattooed.

All powder should be handled with due respect. It has one purpose: to ignite. It is surprising how many people reload modern ammunition, obeying every safety rule, then for some reason they think nothing of pouring a charge of black powder down a muzzleloader in the field with a lighted cigarette, cigar or pipe only inches away from the powder. While some loose smokeless powder is difficult to ignite even with a burning match, all black powder will ignite from a flame, spark or even a heavy blow! Read and obey the safety precautions printed on black powder containers and firearms' instruction booklets.

The shooting industry has waged a massive campaign to promote the wearing of safety glasses. This is twice more essential with black powder guns. Bits of percussion caps often are broken off and fly in every direction. It is just good sense to wear proper safety glasses. Flintlocks, with a flash in the pan only inches away from your eyes, make the wearing of safety glasses even more important. Many black powder shooters who dress to match the period of their guns feel safety glasses distract from their appearance. Which is more important, appearance or common sense eye protection?

The same can be said for ear protection, especially in prolonged test firing or shooting matches. Enjoy black powder shooting, but also consider the protection of your sight and hearing.

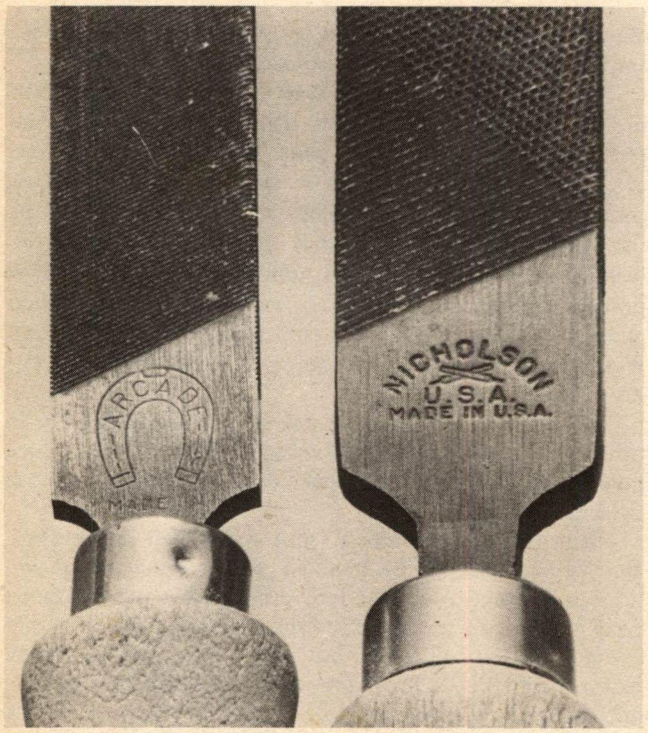
Black powder firearms are not toys. They are firearms, and as such should be handled with all the safety and respect due the most modern gun on the market. Being early editions of modern firearms, and using a more easily ignited powder, they do not have many of the safety features of today's guns. The extra safety precautions are not difficult to learn and will quickly become a desirable habit.

Like all firearms, the more you learn about black powder guns, the more you will enjoy shooting, building and restoring them. This is the primary purpose of this book.

CHAPTER 2

# HAND TOOLS FOR WORKING METAL AND WOOD

## The Variety Is Endless, But Here Are The Ones That Are Essential




*Single serrations on single-cut file, left, produce a shaving edge and thin slivers of removed metal. Double-cut file, right, produces a chewing-type edge, chips of metal.*

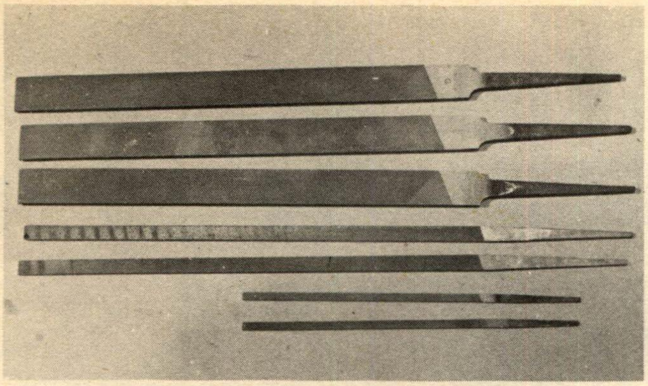
WHEN YOU CLOSELY examine a handcrafted Kentucky or Pennsylvania muzzleloading rifle, you stand in awe at the close fit, workmanship and graceful lines. Even the factory-manufactured frontloaders will impart the same feeling, as from twenty-five to fifty percent of the gun is hand-fitted. The most modern, sophisticated and automated machines of today cannot duplicate these old guns; and I seriously doubt if they ever will equal hand fitting.

The question is why? The answer is simple. All modern, automated equipment and computers are only mechanical copies of man's brain and hands. How much they fall short can best be explained by the following true story.

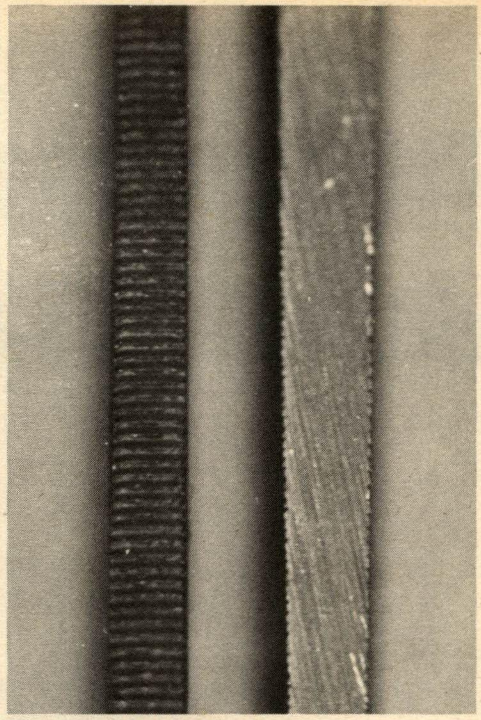
While returning from a business trip on a Boeing 747, I sat beside a computer engineer. During our conversation he stated that if you used the most modern technology and components, it would require a computer taller than the Empire State Building and as large as the state of New York to equal one-fourth the known abilities of the human brain!

All of the old craftsmen shared three qualities: first, a thorough knowledge; second, skill acquired through practice; and third, a deep sense of pride in their work.

There are no deep, dark secrets, no forgotten processes or tools. In fact, the tools and equipment they used were simple and, quite often, handmade. In short, they succeeded in spite of crude tools, not because of the tools! Had they been given the choice between the crude tools

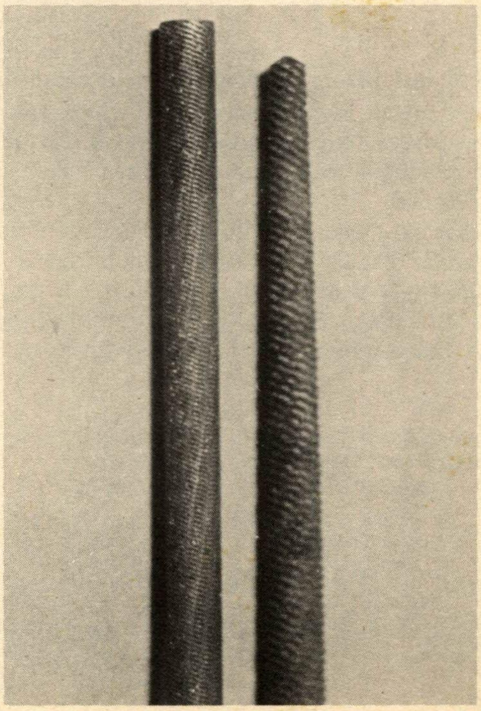


*A set of pillow files: top three are standard-size, double-cut, eight inches, with both edges safed; middle two are eight-inch extra narrow, double-cut, safed on both edges; bottom files are double-cut, four inches in length, safed on both edges.*



*File on left has cutting serrations for cutting metal. File edge on right has no serrations and is called a "safed" edge — it does not cut or remove metal.*

*Example of round files: right file is most common type — coarse cut and tapered. Left file is a parallel round file, fine cut. Both are available in lengths from four to twelve inches.*



they used and modern tools, they would not have hesitated to choose the more efficient modern tools. Any tool is only as good as the brains and skills that guide its use in producing a quality product.

Almost invariably, everytime I allow a gun buff to tour one of our plants they are amazed at how few large, power tools are used in servicing and repairing. They are equally surprised at the large number of hand tools. Time is money to professional gunsmiths. They will not hesitate to buy tools and power equipment, but only if the cost is justified in saving time without sacrificing quality workmanship. If they do purchase a new tool or piece of equipment, it always is of the best quality they can afford.

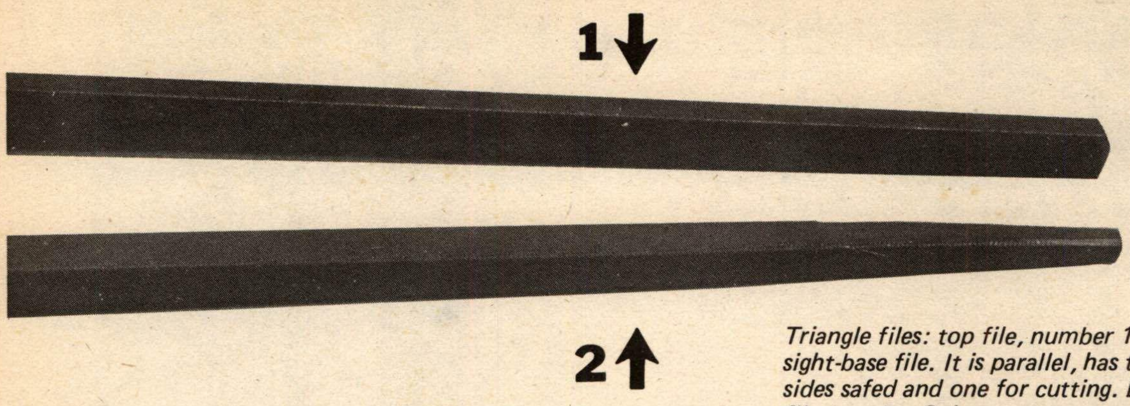
The beginner will be wise if he follows this same basic procedure in acquiring his tools, equipment and measuring instruments. Go slow! Purchase tools only on an absolute need basis, select the best quality affordable, then use them correctly and give them proper care. Good tools, like fine guns, are a pleasure to use and, also like fine guns, rightfully deserve proper use and maintenance. Given this, they will last a lifetime.

Black powder gunsmithing requires almost the same type of tools and equipment as those used for modern gunsmithing. There are, however, some special tools that are essential for performing quality work. It is not recommended that the beginner rush out and purchase all at once the tools described here; rather, this chapter should serve only as a guide in selecting certain tools and measuring instruments as the work demands. All brands and types mentioned are based on years of practical and personal experience.

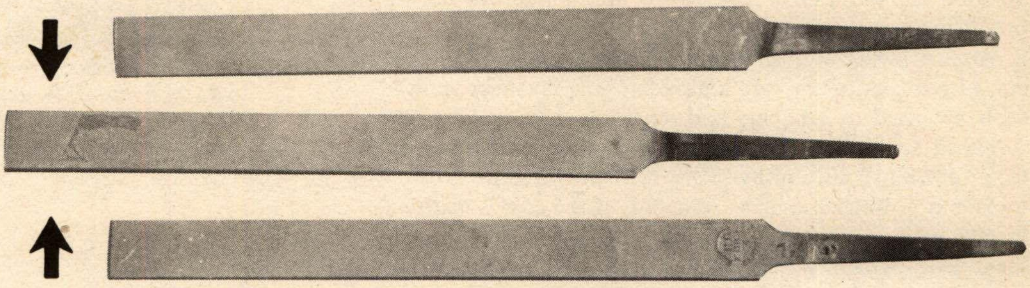
The hardest tool to master, and the one receiving the most use, is the file. In the hands of a man who knows how to use it, a set of good files can produce any gun part, or build the tool to make the part. Generally, you can size up a gunsmith by the number of files he owns. Regrettably, filing is becoming a lost art; and it is an art, no different than a brush in the hands of a painter or a chisel in the hands of a sculptor.

Most beginners are stunned at the vast array of file shapes, sizes and names, but there are actually only two basic types of files: the single-cut and the double-cut.

The primary purpose of the single-cut file is to remove a




*Triangle files: top file, number 1, is a sight-base file. It is parallel, has two sides safed and one for cutting. Bottom file, number 2, is more common and is tapered with all three sides serrated.*

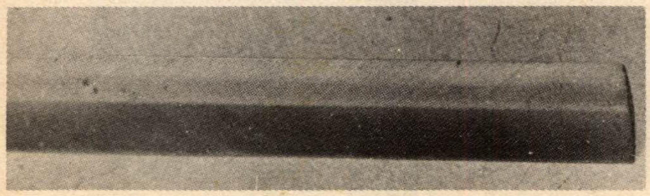


*Screw head files: in size numbers 11, 9, and 7, size designates width of file to coincide with width of screw head slot. Cut only on edges indicated by arrows. Sides are safed.*

lot of metal fast, in long shavings. The double-cut is used to remove less metal, in the form of small chips, and leave a smoother surface. Actually, in the hands of a craftsman, the single-cut can duplicate a double-cut, but it takes skill and years of practice.

Files that are the same width the full length of the blade are known as parallel files. If the width tapers inward toward the tip it is known as a tapered file. Files vary in thickness, although most taper inward toward the end. The flat file is an exception, being of uniform thickness. Degree of coarseness is generally given in numbers, with the larger the number, the finer the cut. Numbers 0, 2 and 4 cut are the ones most often used in gun work.

*Both edges of clockmaker's file are knifelike-bladed, so it's the only file that can be used in any screw head slot to shape and clean up sides.*

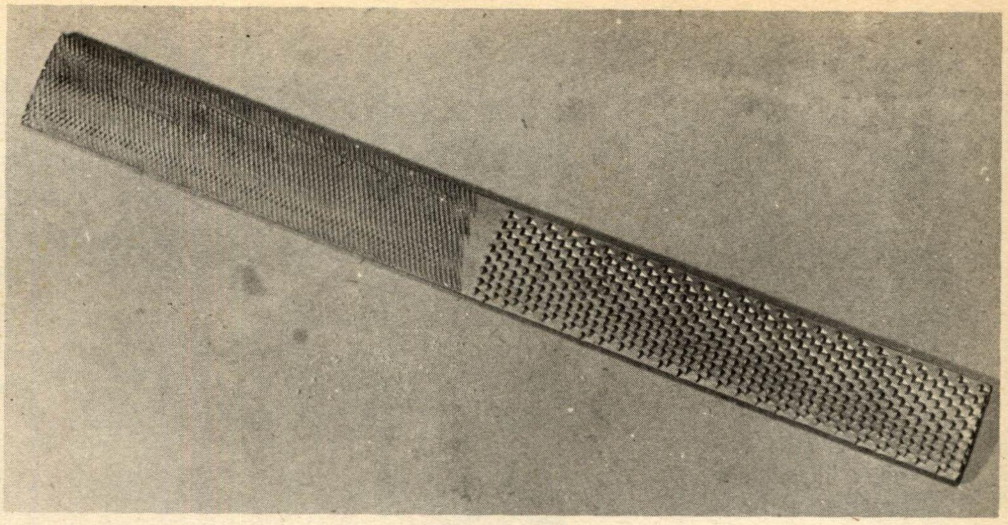


Manufacturers use a wide range of names and terms to describe file types, but all you need remember are the basic categories – your main concern is use, not definition.

So far we have described only those files with a rectangular cross-section shape. There are several dozen other cross-section shapes, but the majority are special-use shapes and can temporarily be disregarded. You may find a need for them later, but the rule in buying tools is to purchase only on a demand basis. Odds are that you will wind up with a dozen or more, but not at the beginning.

There are good and poor files, expensive and cheap files; but I have yet to find a good, cheap file. Those sold by gunsmith supply houses usually are of top grade.

A necessary accessory is what's known as a file card: a wood or metal-backed brush with steel bristles that is used to remove file chips that become stuck in the file teeth. If not removed, the chips will cause deep scratches in the work. An old trick is to use common chalk to fill the teeth in a file. It does not affect the cutting of the file, but does



*The four-in-hand wood rasp has no handle. Bottom is flat, top is rounded. Each end has a fine and coarse cut, hence four rasps.*

prevent metal chips from becoming stuck in the teeth of the file.

The edges of most files have serrations for cutting. I make it a practice to grind away the serrations on one side to obtain what is called a safe edge. On some jobs you may want to deepen, but not widen, a slot. This is where the safe edge is used. If you want to cut both depth and wall, use the edge of the file on which the serrations have not been removed. And remember, store your files so they do not touch, otherwise each will be damaged.

A good set of files for the beginning gunsmith will involve:

Single-cut parallel flat files in four-inch, six-inch and eight-inch lengths. Grind the edge of each safe.

Eight-inch pillar files, cut No. 0, 2 and 4. These are parallel with both edges safed.

Eight-inch extra-narrow pillow files, cut No. 0, 2 and 4.

Six-inch round parallel files, 3/16 inch diameter, cut No. 2 and 4.

Six-inch tapered triangular file, cut No. 2.

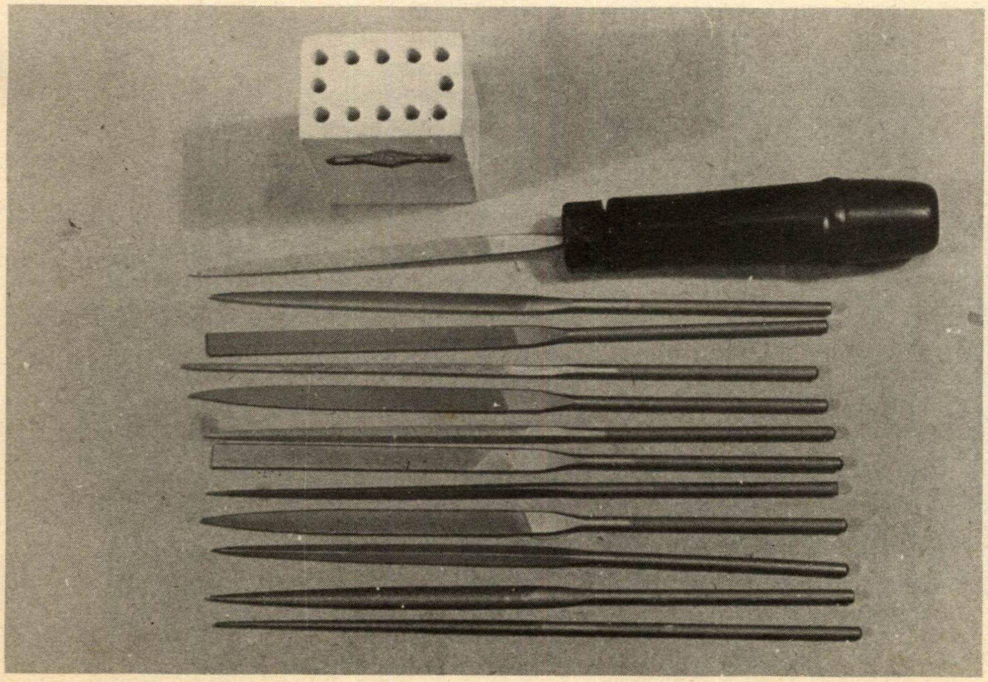
Six-inch sight-base file. This is a parallel triangular file safed on two sides, used to shape dovetail sight slots.

Screw head files sizes 11, 9 and 7. These are safe on the flats, cutting only on the edge, and are used to deepen the screw slot without widening the sides.

Clockmaker's file, size 5 cut with tang. This is a double knife file, very thin, used to reshape burred screw slots.

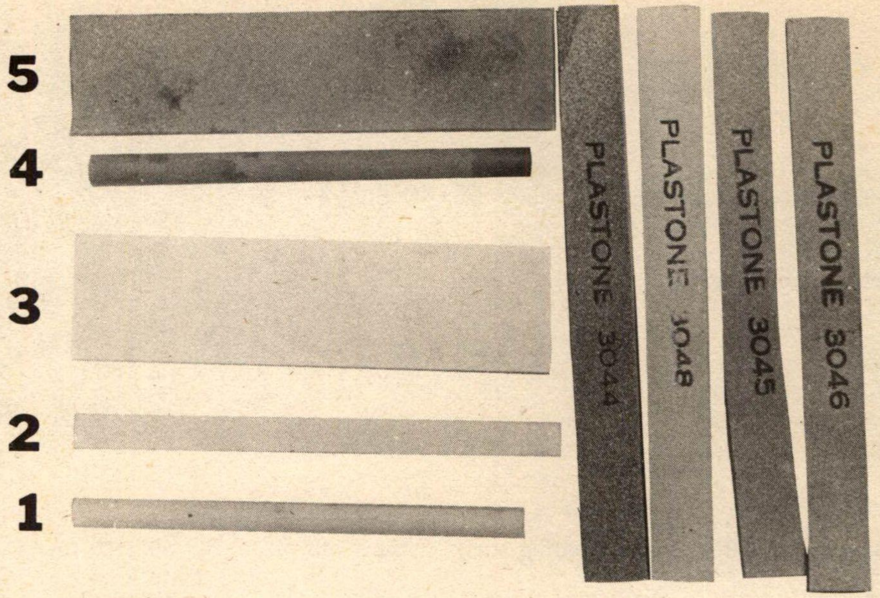
Set of needle files, medium cut. There are twelve files in the set of assorted shapes.

This may sound like a lot of files, but it really isn't, for each will be used in the smallest gun shop, hobby or professional. Given reasonable care and use they will last for years. Even when they no longer will properly cut metal, they serve as fine-cut wood rasps.



*Files under four inches in length are generally termed needle files. They're available in medium or fine cut. Wood holding block receives handles of files. Top file is inserted in a needle file handle, which has a chuck-type lock to hold the file. Gives more control and limits breakage.*

Gunsmith's stone set: No. 1 is hard, white Arkansas triangular shape; No. 2 is square shape; No. 3 is the knife or slipstone. No. 4 and 5 are extra-fine black or surgical Arkansas. No. 4 is round; No. 5 is the knife, and is similar to No. 3. At right are flexible stones, made thin with impregnated oxide for cutting.

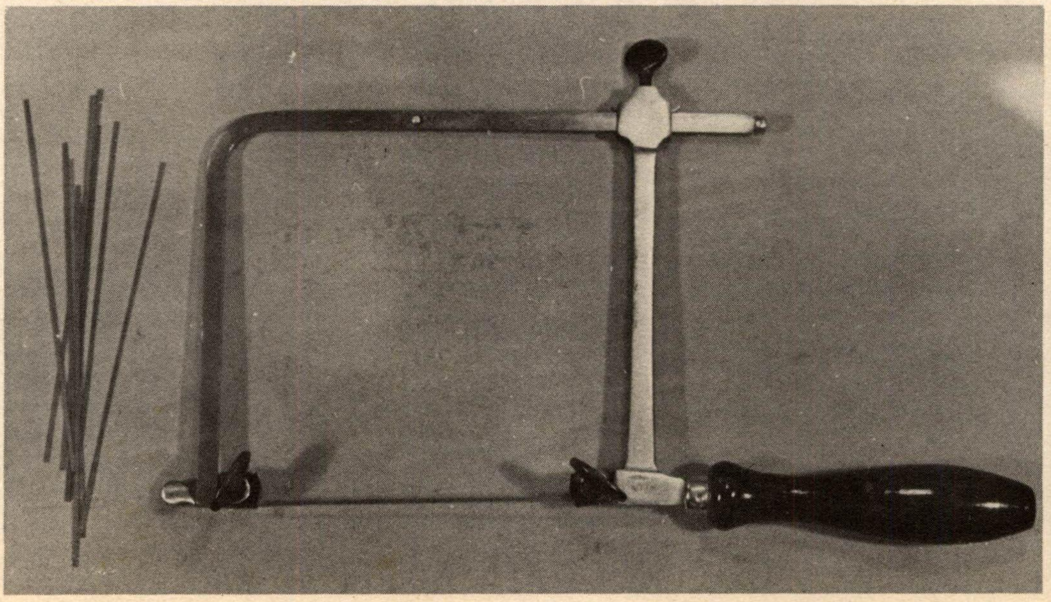


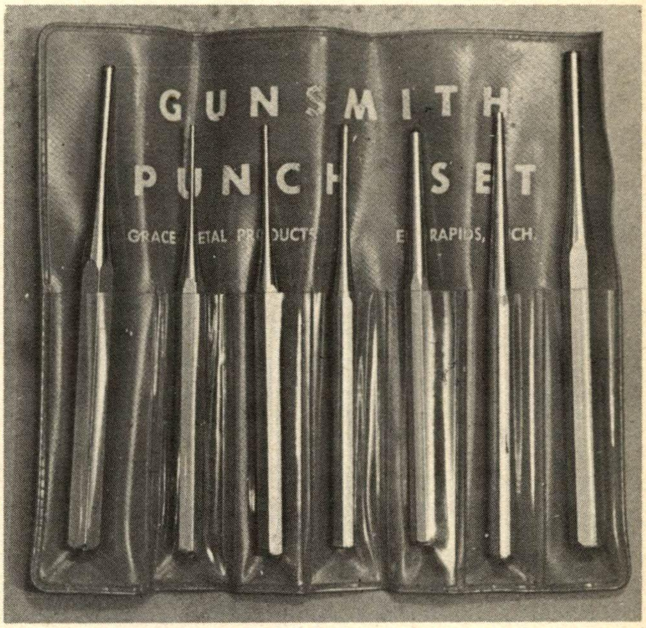

Files for woodworking are called cabinet rasps or simply rasps. Like metal files, there is an abundance of sizes, shapes and cuts. There is one, however, that will serve most of the beginner's needs: the four-in-hand or shoe rasp. Flat on one side, it is half-round on the other side and does not have a tang for a handle. Half of the flat side is coarse cut, the other half fine cut. The half-round side is similarly divided into a coarse cut end and fine-cut end. In essence, you have four rasps in one tool, hence the name four-in-hand. This one rasp, plus an assortment of worn metal files, will get the beginner well on his way in wood shaping.

Getting back to metalworking tools, small Arkansas stones are a must. Like files, there is no shortage of shapes, sizes and cuts. The simple solution is to purchase a gunsmith's Arkansas stone file set. This set of five stones will serve ninety percent of your needs. You can add additional shapes later as the need arises. Arkansas stones cut faster dry, slower and more smoothly with a light lubricant between the stone and the work. Always clean the stones with mineral spirits and store each separately to prevent breaking and chipping.

While on the subject of cutting tools, a good hacksaw is a must. The vast majority on the market leave a lot to be desired. The primary requirement is a rigid frame that will hold the blade stiff. The best I have found is the Challenger

*The jeweler's deep saw frame with attached blade: serrated clamps hold the tiny blades on each end while the top of the frame is pushed forward and secured by locking thumbscrew. Replacement blades cost under a dime each.*





*Grace Gunsmith Punch Set is probably the best starter set of pin punches — has most-used punches.*

marketed by Brownell's. The blade can be tightened almost to the breaking point, which results in a clean, straight cut. A ten-inch blade is preferable, since the possibility of wobble is less than in longer blades. The number of teeth per inch required depends on the metal to be cut. The thinner the metal, the more teeth per inch on the blade, 18, 24 and 32 teeth per inch are the ones most used by gunsmiths.

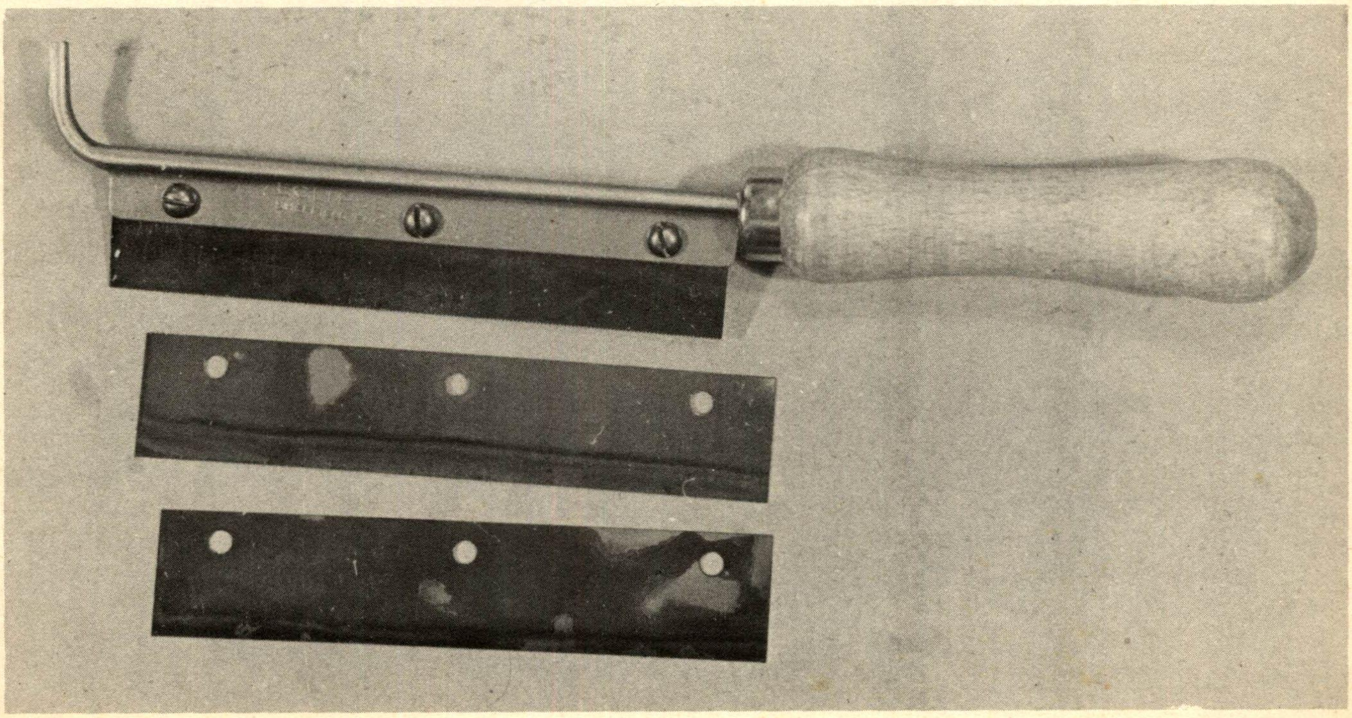
A handy little tool is the gunsmith bench saw. It is a short, thin, but wide blade with a stiff back and fine teeth. It is used to make extra smooth, straight and deep cuts in wood or metal.

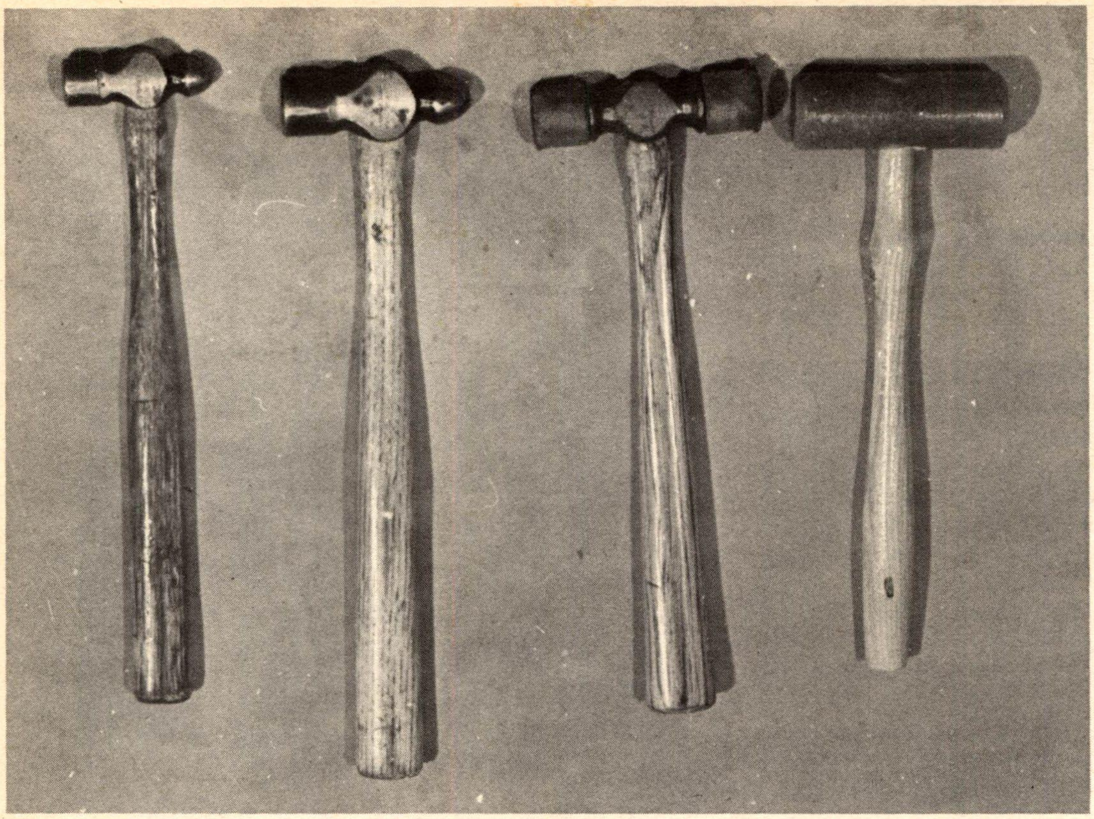
A saw that most gunsmiths overlook is the jeweler's saw with a deep frame. It has many uses in gun work where cutting space is limited. The deep frame and narrow, thin blades of the jeweler's saw are ideal for cutting sheet metal inserts from stock material for practical and decorative purposes, rather than purchasing them in finished form.

Pin punches always are a necessity in the gunsmith shop. The Grace pin punch set, consisting of five pin punches of various sizes, a starter punch and a center punch, will cover about ninety percent of your needs. A welcome addition is the Brownell replaceable pin set that comes in three diameters: 3/64, 1/16 and 3/32 inch. These small diameters are the ones most often broken. With the Brownell set, you just unscrew the top, drop out the broken tip and slide in a replacement pin. Replacement cost is a fraction of the solid-type punches.

The main problem with pin punches is the person using

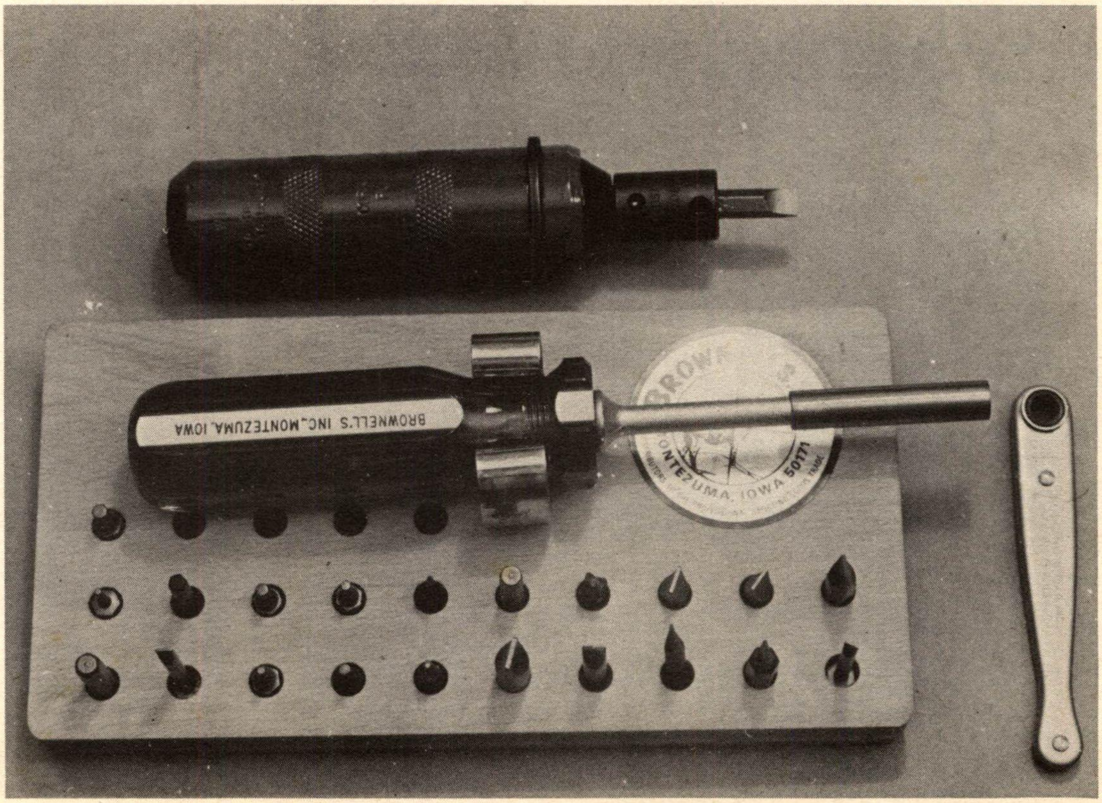
*The gunsmith's bench saw is for wood or metal. It's used where a thin, fine precision cut is required. At bottom are interchangeable blades.*





*From left in this starting set of gunsmith hammers is the four-ounce ballpeen hammer, eight-ounce ballpeen hammer, composition mallet and rawhide mallet.*

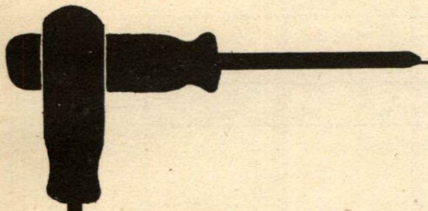
*Brownells' Screwdriver Kit includes solid-handle screwdriver, wood holding block, twenty-tooth offset ratchet attachment and Impact Driver with adaptor and bit.*



them. First, they fail to use a starter punch to get the gun pin moving. Next, they use a pin punch too small in diameter to finish pushing the pin out. Correct these two errors and you will cut punch breakage in half.

A four-ounce and an eight-ounce ballpeen hammer will answer most shop needs. The new composition head hammer, plastic on one end and rubber on the other, is inexpensive and will solve a lot of problems where a blow without marring is required. An old gunsmith favorite is the rawhide mallet. Buy and use one and you will never be without it. Its uses are too numerous to even begin explaining. About fifteen years ago I made a special little hammer out of the end of a large cold chisel. It is light, and the one I use the most. If you do not want to tackle the job of making one, the closest hammer to it you can buy is the crosspane hammer.

Now we come to the tool that ruins the appearance of more guns than any other tool, the screwdriver! The common screwdriver is designed to remove wood screws and is totally useless in gun work. The blades have a taper on each side, somewhat like the capital letter V, to match a similar screw slot in wood screws. Guns use machine screws with parallel straight-side screw slots, similar to the capital letter U. If a wood screw-bladed screwdriver is used in a machine screw slot, the torque automatically twists the screwdriver blade out of the slot and burrs the screw-slot



## SCREWDRIVERS

### Glossary of Screwdriver Terms

**ALIGNMENT**
Shafts and/or tips made of nonconductive nonmagnetic materials.

**ALLEN**
Proprietary name for hex-shaped tip and blade.

**AUTOMATIC**
Motor or air-driven production screwdrivers.

**BALL-END**
Special hex-ball tip which can be turned at an angle.

**BERYLLIUM**
See nonmagnetic.

**BLADE**
Shank or shaft of the screwdriver.

**BRISTOL**
Proprietary name for spline tip.

**BUTTERFLY**
See clutch-head.

**CABINET**
Tip not wider than shaft — for use on recessed holes.

**CARPENTER'S**
Usually refers to screwdriver with wooden handle.

**CLUTCH-HEAD**
Special tip shaped like a figure eight.

**CROSS-RECESSED**
See Phillips.

**CROSS-SLOT**
Phillips or Reed and Prince tip.

**ELECTRICIAN'S**
Screwdriver with cabinet tip and/or round blade.

**FLEX-SHAFT**
Shaft made of flexible material which allows screwdriver to work around corners.

**FREARSON**
See Reed and Prince.

**HEX-TIP**
See Allen.

**INSULATED**
Coating or sleeving on shaft prevents accidental contact with hot electrical circuits.

**JEWELER'S**
Tiny screwdrivers usually less than 0.1" blade width.

**KEYSTONE**
Shaped tip (for slotted screws) wider than the shaft to which it is attached.

**LAUNCHER**
See screw-holding.

**MAGNETIC**
Tip is intentionally magnetized to hold ferrous screws.

**MECHANIC'S**
Screwdriver with keystone tip and/or square blade.

**METRIC**
Tips measured in millimeters rather than inches.

**NEON**
Screwdriver with lamp in handle to detect voltage.

**NONMAGNETIC**
Shaft and tip made of nonferrous materials, usually Beryllium copper.

**OFFSET**
Handleless angled screwdriver for use in restricted spaces.

**OPTICIAN'S**
Jeweler's screwdriver with blades to match small screws found on eyeglasses.

**PHILLIPS**
Proprietary name for cross-slot rounded U tip.

**RATCHET**
Mechanism in handle eliminates need to remove tips from screw after each forward turn.

**REED AND PRINCE**
Cross-slot pointed V tip.

**REGULAR**
Conventional tip for use on ordinary slotted screws.

**ROBERTSON**
See Scrulox.

**SCREW-HOLDING**
Mechanism at tip holds screw in place until threads are engaged.

**SCREW-STARTER**
See screw-holding.

**SCRULOX**
Special proprietary tip is square shaped.

**SHOCKPROOF**
Refers to plastic insulated handles and/or insulated shafts.

**SPLINE**
Special tip has four or six flutes.

**SQUARE BLADE**
Shaft made from square stock which can be turned with a wrench if necessary.

**SQUARE-RECESSED**
See Scrulox.

**STUBBY**
Compact screwdriver with short, fat handle.

**TORQUE**
Screwdriver has a torque indicator built into the tool to tell operator how much force is being exerted.

**TORQUE-AMPLIFIER**
A hollow handle which fits over regular handle to improve grip.

**U-SLOT**
See Phillips.

**V-SLOT**
See Reed and Prince.

# JENSEN TOOL TIPS

## SCREWDRIVERS

### PHILLIPS

| | MACHINE SCREWS | | WOOD SCREWS | | SHEET METAL SCREWS |
|---|---|---|---|---|---|
| TIP SIZE | FLAT, OVAL | ROUND | FLAT, OVAL BINDING | ROUND FILLISTER | FLAT, ROUND, OVAL BINDING |
| 0 | 0, 1 | 0,1 | 0,1 | 0,1 | — |
| 1 | 2-4 | 2-4 | 2-4 | 2-4 | 2-4 |
| 2 | 5-9 | 5-10 | 5-10 | 5-10 | 5-10 |
| 3 | 10-16 | 12-16 | 12,¼" | 12,¼",5/16" | 12,14 |

### CLUTCH

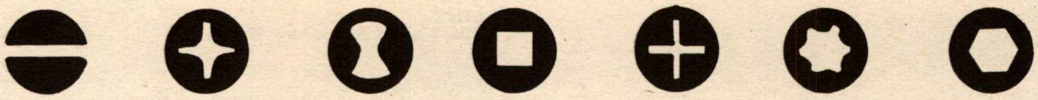
| TIP SIZE | ROUND | BINDING | FLAT | OVAL | FILLISTER | HEXAGON |
|---|---|---|---|---|---|---|
| 3/32" | 2,3 | 2,3,4 | 2,3 | 2,3 | 2,3,4 | 2,3 |
| 1/8" | 6 | 6 | 4 | 4 | 6 | 4,6 |
| 5/32" | 8,10 | 8,10 | 6,8 | 6,8 | 8,10 | 8,10 |
| 3/16" | 12 | 12 | 10 | 10 | 12 | 12 |
| 1/4" | 14,¼" | 14,¼" | 12,14,¼" | 12,14,¼" | 14,¼" | 14,¼" |

### ALLEN HEX

| WIDTH ACROSS FLATS | SET SCREWS | 1960 SERIES CAP SCREWS | WIDTH ACROSS FLATS | SET SCREWS | 1960 SERIES CAP SCREWS |
|---|---|---|---|---|---|
| .028" | 0 | — | 1/8" | 1/4" | — |
| .035" | 1,2 | — | 9/64" | — | 8 |
| .050" | 3,4 | 0 | 5/32" | 5/16" | 10 |
| 1/16" | 5,6 | 1 | 3/16" | 3/8" | 1/4" |
| 5/64" | 8 | 2,3 | 7/32" | 7/16" | — |
| 3/32" | 10,12 | 2-5 | 1/4" | 1/2-9/16" | 5/16" |

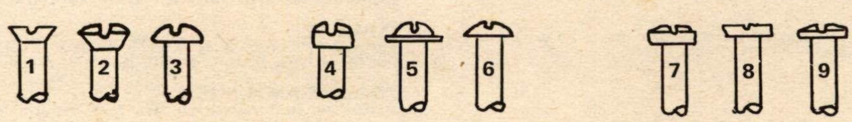
### MACHINE SCREW DATA

| SIZE AND THREAD | SCREW O.D. | HEAD O.D. FLAT | HEAD O.D. ROUND | HEAD O.D. FILLISTER | HEX NUT ACROSS FLATS | CLEARANCE DRILL | TAP DRILL |
|---|---|---|---|---|---|---|---|
| 0-80 | .060" | .119" | .11" | .096" | .156" | No. 52 | No. 53 |
| 1-64 | .073 | .146 | .138 | .118 | .156 | 47 | 53 |
| 2-56 | .086 | .172 | .146 | .124 | .187 | 42 | 48 |
| 3-48 | .099 | .199 | .169 | .145 | .187 | 37 | 44 |
| 4-40 | .112 | .225 | .193 | .166 | .250 | 31 | 40 |
| 5-40 | .125 | .252 | .217 | .187 | .250 | 29 | 36 |
| 6-32 | .138 | .279 | .240 | .208 | {.250 .312 | 27 | 33 |
| 8-32 | .164 | .332 | .287 | .250 | {.250 .375 | 18 | 28 |
| 10-32 | .190 | .385 | .334 | .292 | {.312 .375 | 9 | 20 |



Regular Phillips Clutch Scrulox Reed Prince Spline Allen Hex

## HEAD STYLES




1. FLAT
2. OVAL
3. ROUND
4. FILLISTER
5. WASHER
6. OVAL BINDING
7. FILLISTER BINDING
8. FLAT BINDING
9. STRAIGHT SIDE BINDING

edges. So, obviously, the tip of a machine screw screwdriver blade must have parallel sides to match the machine screw slot.

Many so-called gunsmith screwdrivers are nothing but the common screwdriver blade with tips ground parallel. It looks like a good idea, but it just doesn't work. The blade is weak where the ground parallel section joins the rest of the blade. The end result is an easily broken blade.

A hollow-ground blade tip is the answer. This blade has a concave section on each side of the shank, blending down into short, parallel sides to match the parallel sides of the machine screw slot. When you turn the screwdriver, the torque is transmitted up the full blade shank. It is quite similar to a tapered flat spring.

In my opinion, the best gunsmith screwdriver on the market is the Brownell Magna-tip. It consists of a good, firm handle solidly fitted to a shank, with a small magnet in the forward part of the shank. The blades, or bits, are short, six-sided, high-speed, industrial power driven, metal correctly hollow ground. The magnet in the shank holds the bits firmly in place, yet allows you to change bits in seconds. The complete set consists of the handle and shank, twenty-four bits, and a board to hold bits and handle. The price of the set is less than you would pay for twenty-four of the cheapest, common screwdrivers.

If you want a special screwdriver blade size, just purchase a thick bit and hollow grind the tip to the desired dimensions. For those who want to make their own screwdrivers, Brownell offers a kit. The steel is Sol-Hex Ten, the toughest tool steel known. It can be fully treated with a propane torch and kitchen oven! The handles are tenite-2, preshaped and drilled. You soak them in hot water, force them on the screwdriver shank and when cool they will not turn loose.

One of the main problems in restoring muzzleloaders is removal of old screws. Soaking in penetrating oil helps, but the best solution is a correct-fitting, tough screwdriver that will take the necessary pressure. If hand pressure will not move the screw, use the Brownell impact driver and adaptor that accepts the Magna-tip bits. The impact driver works on the rotary-impact principle. Just place the bit in the screw slot and tap the end of the driver with a hammer. The combined impact, which in itself will loosen many screws, plus the rotary action at the same instant generally will loosen any stuck screw.

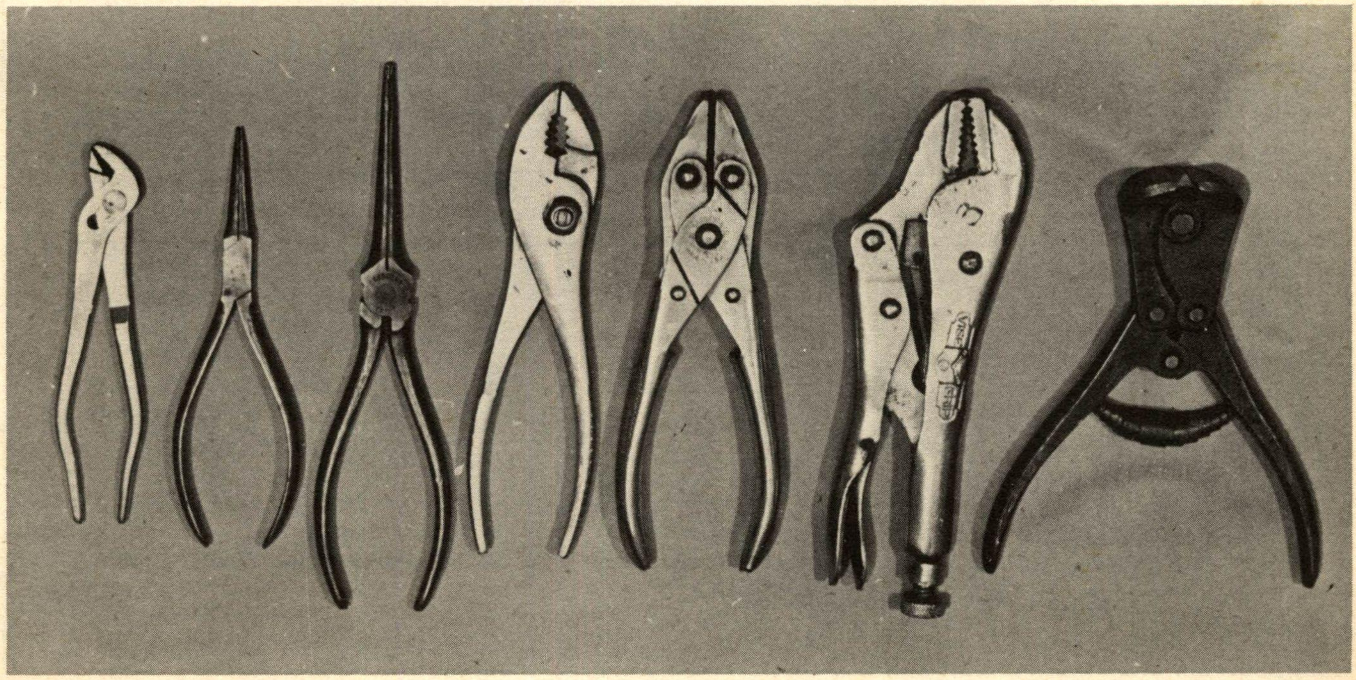
With any screw, the first step is to clean out the slot thoroughly. Next, select the screwdriver blade that fits snug, filling the slot and not extending past the diameter of the screw head. Simple as this may seem, the usual procedure is to ram in the first screwdriver handy and twist away, expecting the screw to turn easily. The results usually leave a lot to be desired, to say the least.

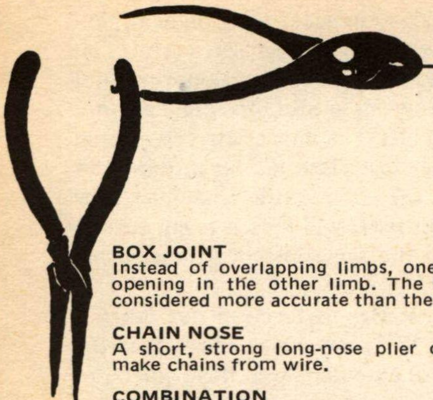
Pliers are really a hand-held vise. Depending on size and shape, they amplify the strength in your fingers and hand. Each type has a special purpose, and although the purposes may sometimes overlap, a good set will solve many gunsmithing problems. They are not expensive but should be chosen wisely.

The common six-inch, slip-joint pliers can be purchased in any hardware store, just be sure the serrations in the jaws are clean and sharp. It would take a book to list all of their uses. A half-brother to the slip-joint pliers are water-pump pliers. Where slip-joint pliers have only two opening settings, water pump pliers usually have four or six settings of distance between the closed jaws. Either eight or ten-inch size pliers are best.

The most useful are Sargent parallel-action pliers. There are several imitations, but stick to the Sargent brand in about six-inch size. With regular pliers, the jaws open wide at the end and narrow closer to the hinge joint.

*Gunsmith's pliers: from left, miniature channel lock, miniature needle-nose, eight-inch extra-long needle-nose, six-inch common slip-joint, six-inch parallel, six-inch vise-grip and gunsmith nippers.*





# PLIERS

## Glossary of Plier Terms

**BOX JOINT**
Instead of overlapping limbs, one limb is fitted inside a cutout opening in the other limb. The box joint is long-wearing and considered more accurate than the lap joint.

**CHAIN NOSE**
A short, strong long-nose plier originally used by jewelers to make chains from wire.

**COMBINATION**
Pliers having one round nose and one flat nose limb, used in jewelry making.

**CRIMPING CUTTER**
Refers to cutters which crimp the end of the cut-off wire so that it will not fall back through a circuit board.

**DIAGONAL OR DIKE**
Refers to cutting pliers which have their cutting edges aligned at a slight angle to the limbs.

**DOUBLE END**
Two pair of production pliers having the ends of their handle jointed to each other so that the operator may have two choices of working ends without putting down the tool.

**DUCKBILL**
See flat nose.

**FLAT NOSE**
Having tips with flat, wide surfaces.

**FLUSH CUT**
A cutter edge design which leaves the cut-off wire end perfectly square.

**GAS PLIERS**
Simple slip-joint pliers in familiar household or automotive pattern.

**GROOVE JOINT**
See slip joint.

**HEMOSTAT**
A surgeon's pliers with locking feature and scissor-type handles.

**HIGH HARDNESS**
Cutting tools having edges of carbide or special tool steel to handle hard steel, nickel wires or ribbon.

**INSERT**
Refers to cutters which have separate tips of tool steel or carbide usually welded into place on the cutter limbs.

**INSTRUMENT**
Refers to small precision pliers.

**LAP JOINT**
Conventional plier joint where one limb lies against the other.

**LINEMAN**
Side-cutting pliers used by utility linemen and electricians.

**LONG NOSE**
A conventional wire-bending plier with long reach.

**NEEDLE NOSE**
Having long, narrow tips to reach restricted spaces.

**NIPPER**
Cutting pliers which have their cutting edges aligned at right angles to the limbs.

**PINCERS**
Synonym for pliers.

**RELAY**
Small, thin-bladed flat nose pliers used to adjust relay contacts.

**RETAINING RING**
Pliers (similar to round nose) designed to open or close retaining rings. Known as internal or external, depending on the type of ring used.

**ROUND NOSE**
Having tips that are round and tapered almost to a point.

**SCREW-JOINT**
A machine screw instead of a rivet is used at the axis of the joint and it may be tightened periodically to overcome wear.

**SEMIFLUSH CUT**
A cutter edge design which leaves only a small peak on the cut-off wire end.

**SERRATION**
Grooves cut into the plier tips to facilitate the holding of wires.

**SHEAR CUTTERS**
Cutting pliers with scissors-like action which lessens shock on sensitive electronic components.

**SIDECUTTING**
Pliers which have cutting edges aligned parallel to the limbs.

**SLIP JOINT**
Pliers having an adjustable joint to allow a wide range of jaw openings.

**SMOOTH EDGES**
No serrations.

**SNAP RING**
See retaining ring.

**SWEDISH**
Refer either to pliers made of Swedish steel, or to a familiar head pattern for diagonal cutters.

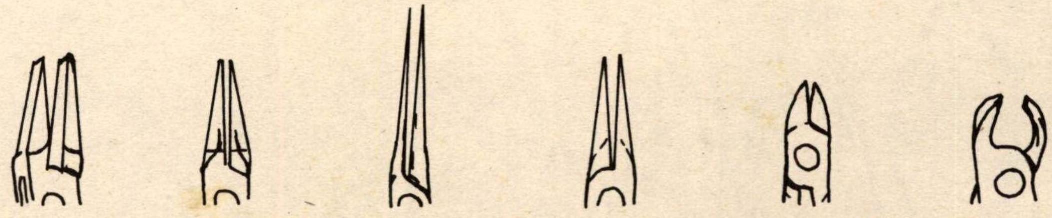
**TRANSVERSE CUTTERS**
Cutting pliers having small, nipper-type cutting edges at the end of the limbs.

**WATER PUMP**
See slip joint.

**WIRE GRIPPING**
Refers to a wire-cutting plier which does not release the cut-off wire segment until the jaws are opened by the operator.

**WIRE STRIPPING**
Cutting pliers equipped with one or more small holes adjacent to the cutting-edge to allow double-duty as a wire stripper.

## HEAD STYLES



FLAT NOSE | ROUND NOSE | NEEDLE NOSE | CHAIN NOSE | DIAGONAL CUTTER | END NIPPER

## JENSEN TOOL TIPS

### PLIERS

#### Tool Materials

**TENSILE STRENGTH**

| MATERIAL | TENSILE STRENGTH LBS./SQ. IN. |
|---|---|
| Aluminum, rolled | 13,000 to 24,000 |
| Brass | 40,000 to 120,000 |
| Copper, annealed | 32,000 |
| Copper, hard drawn | 68,000 |
| Iron, annealed | 42,000 |
| Phosphor bronze | 40,000 to 130,000 |
| Steel, annealed | 70,000 to 290,000 |
| Tungsten | 200,000 to 600,000 |

**METAL CONDUCTIVITY** (Relative, annealed copper = 1.00)

| | | | | | |
|---|---|---|---|---|---|
| ALUMINUM | .619 | IRON | .179 | SILVER | 1.05 |
| BISMUTH | .014 | LEAD | .078 | TIN | .149 |
| BRASS | .256 | NICKEL | .198 | TUNGSTEN | .308 |
| GOLD | .706 | PLATINUM | .153 | ZINC | .295 |

**FINISHES**

**POLISHED** A description for pliers which are buffed to a dull sheen after stamping and grinding. Polished pliers are not rustproof, and should be kept lightly oiled.

**BLUED** This process converts the tool steel surface to a deep blue, almost black, color. The finish is resistant to oxidation.

**NICKEL-PLATED** A fine, protective finish for pliers. Attractive and highly resistant to oxidation. Available dull and bright. The bright nickel-plate finish is often mirror-like in quality.

**CHROME-PLATED** A secondary plating usually applied over a nickel plate. Attractive, bright, and extremely resistant to corrosion. Usually identified by its slight bluish caste.

**PVC-COATED** Polyvinylchloride plastic coating applied to plier handles. Acts as a cushion grip to ease operator fatigue. Also protects plier handles against corrosion. Usually available in a choice of colors. Applied by dipping or in tubing form.

Parallel-action pliers, as the name implies, keep the full length of both jaws exactly parallel when open or partially closed. The jaws have small teeth, with a shallow groove lengthwise of the jaws. This little groove makes them the perfect tool for installing and removing pins in a gun. You will find hundreds of other uses for them, and I have yet to see a gunsmith without one or more pairs.

Next on the list are needle-nose pliers. The term needle-nose can be confusing due to manufacturers misusing the term. Those you want have long, narrow jaws, flat on the inside with serrated teeth. Buy a good six-inch size for your gun work, then buy a cheap pair of the same length. The latter are useful for holding pins, screws and parts that are being heated for tempering, case hardening, etc. A third pair you might consider are miniature needle-nose pliers to hold small parts in close places.

Vise-grip pliers, about six inches in length, are invaluable in gunsmithing; almost like having a third hand. You adjust the jaw opening with a screw located in the end of the top handle. The bottom handle closes the jaws and a lever on the bottom handle locks the jaws tight. This ability to lock on a part or parts makes the vise-grip pliers serve so many purposes that most gunsmith shops have a standard six-inch, an extra-cheap six-inch set to hold parts being soldered, heated or ground, plus a four-inch pair for small work.

There are several types of cutting pliers – side cutters, end cutters and so on – all of little value in gun work. But a pair of either gunsmith nippers or piano wire nippers are a good choice. Both have a wide front end that does the cutting, and each is designed to cut wire, drill rod, pins, etc., to desired lengths. The main difference is that piano wire nippers depend on hand pressure only, while gunsmith nippers have a linkage that amplifies hand power about three times. Either type is suitable, and it is a matter of personal preference.

The final pliers in the set usually are not termed pliers, but forceps. They originated in the medical profession, then were picked up and used in electronics and, finally, in gunsmithing. They serve as long, thin needle-nose pliers to hold small screws, pins, etc., or to retrieve same when they slip and fall down into the innards of a gun component. Any gunsmith or electronics supply house will have several sizes available.

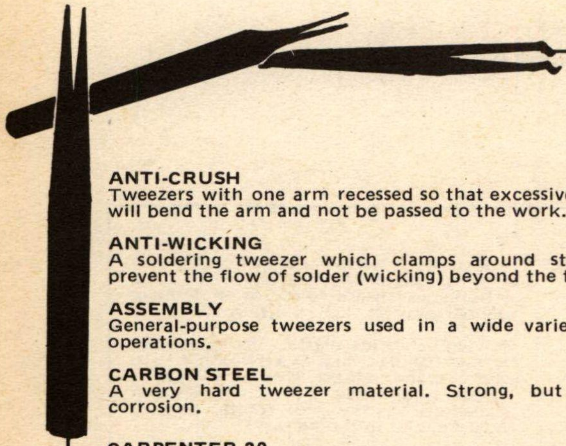
There are two common household tools that prove useful in gun work. The first, a pair of tweezers, are useful

in removing splinters from your fingers, holding small parts, etc. Next are scissors, used for cutting paper patterns that are useful in inletting stocks, shaping forends, copying parts and other uses.

Steel burnishers are tools whose use is almost forgotten. Made from top-grade tool steel, they are highly polished, hardened to maximum and then polished to a mirror finish. When pushed back and forth across a piece of steel, they both work-harden and polish the steel to an extra-smooth finish. At one time this was the way metal surfaces were prepared for bluing and browning. Even today it is difficult to obtain the burnished sheen with the best of power polishing wheels. On wood they close the pores on oil finishes, giving a look that has to be seen to be appreciated. If you want a good ramrod, sand it as usual and then apply a thin coat of oil and steel burnish it. It will end up hard and slick as glass.

Many black powder rifles and pistols have octagon barrels, and trying to polish them using regular power buffers without ruining the edges is a tough job for even an expert with years of experience. The solution is hand polishing, and you do not have to be an expert. You will need several rolls of 1½-inch-wide aluminum oxide cloth; available in thirty-foot lengths in grits of 120, 220 and 320 with the larger the number, the finer the grit.

Simply cut off about six inches from the roll, then lay a one-inch-wide smooth file, or similarly thick piece of steel, the length of the cut piece. Wrap the edges of the cloth around the file and, with medium pressure, one hand on each end of the file, file crossways to the barrel, push and



## TWEEZERS

**ANTI-CRUSH**
Tweezers with one arm recessed so that excessive finger pressure will bend the arm and not be passed to the work.

**ANTI-WICKING**
A soldering tweezer which clamps around stranded wire to prevent the flow of solder (wicking) beyond the tweezer.

**ASSEMBLY**
General-purpose tweezers used in a wide variety of industrial operations.

**CARBON STEEL**
A very hard tweezer material. Strong, but susceptible to corrosion.

**CARPENTER 20**
A tweezer alloy which is nonmagnetic and resists acids.

**CLAMPING**
Normally closed tweezers which can be used as a small vise or for heat sinking.

**CLOCK**
Extra-long utility tweezer used by clockmakers.

**CUTTING**
Refers to tweezers having cutting edges for use on very fine wires.

**DIAMOND**
A three-fingered device used to hold gems, ball bearings, or other small parts.

**DICE**
Refers to tweezers with large surfaces for holding semiconductor components.

**DUMONT-STYLE**
A series of fine tweezer patterns originally developed for watchmaking in Switzerland.

**DUMOXEL**
A trade name of the Dumont Company referring to their nonmagnetic stainless tweezer alloy.

**FINGER**
Tiny tweezers strapped to the end of one finger and manipulated with that finger and the thumb.

**HAIRSPRING**
A tweezer with tiny slots in the jaws to hold watch hairsprings; or a cutting tweezer designed to cut hairsprings.

**INDUSTRIAL**
See assembly.

**INOX**
A trade name of the Dumont Company referring to their stainless-steel tweezer alloy.

**LOCKING**
Tweezers that can be held closed by sliding a small button into position.

**NICKEL-PLATED**
Carbon steel tweezers plated to resist corrosion.

**NICKEL-SILVER**
A tweezer alloy which is nonmagnetic and relatively nonscratching.

**NONMAGNETIC**
A tweezer alloy which cannot be magnetized.

**NONSPARKING**
Refers to tweezers made of brass or a copper alloy.

**OFFSET**
Tweezer ends are angled slightly for convenience in handling.

**OBLONG**
Refers to jaws which are flat, rounded, and have a large gripping surface.

**PIN**
Tweezers with a small pin in one arm and a hole in the other, designed to maintain point alignment.

**PLASTIC**
Tweezers that are nonconductive and nonmagnetic.

**PLEEZER**
Trade name of EREM Corporation for heavy-duty tweezers which have many of the properties of pliers.

**POINTED**
Ends of tweezer arms come to a fine point.

**POSTAGE STAMP**
See oblong.

**REVERSE ACTION**
See clamping.

**ROUND**
Ends of tweezer arms are rounded or blunted.

**SERRATED**
Having tips with tiny grooves or cross-hatching to enhance gripping qualities.

**SOLDERING**
See clamping.

**STAINLESS**
A tweezer alloy resistant to corrosion but not quite as hard as carbon steel.

**STUBBY**
Short tweezers designed to be gripped near the points for maximum leverage.

**TITANIUM**
A nonmagnetic tweezer alloy.

**VACUUM**
Refers to vacuum parts-handling systems which do the work of tweezers.

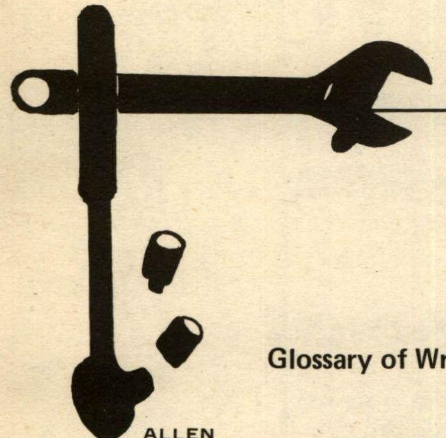
**WAFER**
Refers to tweezers with large surfaces for holding semiconductor components.

**WIRE**
Tweezers formed out of heavy-gauge wire, as opposed to forgings.

pull it back and forth the full length of the barrel – taking care to keep the tool flat against the barrel. Start with a 120 grit, then 220 and finally 320. Polish each of the flats before switching grits. Do not try to polish across the flat, as you will only leave hard-to-remove scratches. Always polish the barrel lengthwise. With patience and care you can achieve a smooth, high polish with the edges nice and sharp.

Incidentally, this is the same procedure for draw-filing a barrel. Why it is called draw-filing is a mystery to me. You always push the file the full length of the barrel, lift the file from the surface, then move back to the starting point and push again. If you pull the file back, it will not cut; instead, it will pick up metal particles and scratch the surface. For filing and polishing, the file is positioned at right angles, ninety-degrees, to the barrel. Use both hands on the file, with just enough space between them to allow the barrel to pass.

Steel wool is an item always in use when working on any gun. It is designated by a series of 0s, or aughts with the more 0s the finer the steel wool. Number three aught (000) and four aught (0000) are those most used for steel and woodwork. For example, when saturated with a rust remover its scrubbing action accelerates the removal of rust. The four aught can be used for burnishing steel or



## WRENCHES

### Glossary of Wrench Terms

**ALLEN**
Proprietary name for hex-shaped male wrench head.

**BASIN**
A plumbers' wrench for use in extremely restricted spaces.

**BOX**
Wrench head with six or twelve points to completely surround the nut or bolt.

**BRISTOL**
Proprietary name for male spline wrench head.

**COMBINATION**
A right-angle wrench with open-end head on one end and same size box head on the other.

**DEEP SOCKET**
A long socket that can turn nuts without interference from protruding bolts.

**DOUBLE HEAD**
A right-angle wrench with a head at each end, of same or different sizes.

**DRIVE-SIZE**
Refers to the dimensions of the square parts which mate between socket and handles usually ¼", 3/8", or ½" drive.

**ELL**
Handle for sockets shaped in form of letter "L."

**EXTENSION**
Adapter to extend working length of spinners and other handles.

**FLEX-HANDLE**
Similar to a spinner, but shaft is flexible and can work at an angle and even around corners.

**HINGE**
Socket handle able to work at various angles in close quarters.

**HOLLOW-SHAFT**
Refers to nutdrivers with hollow shaft able to be slipped down over protruding screws.

**IGNITION**
Small open-end wrenches used to adjust automobile distributors and for general use in electronics and machinery.

**IMPACT**
Sockets turned by air or hydraulic pressure or by striking with a mallet.

**L-KEY**
Male wrench made from one piece of hex stock, bent to provide its own handle.

**METRIC**
Refers to wrenches having openings measured in millimeters instead of inches.

**MONKEY**
Adjustable wrench with parallel, smooth jaws used by auto mechanics.

**NUTDRIVER**
Spinner with socket attached.

**OBSTRUCTION**
A double-end wrench shaped like a U or half moon. For use in restricted spaces.

**OFFSET**
Heads are positioned at an angle to the handle for convenience in working.

**OPEN-END**
Familiar mechanic's wrench which grips the hexagonal bolt snugly on two opposite sides.

**PALNUT**
External-type hex nutdriver.

**PIPE**
See Stillson.

**RATCHET**
Mechanism in handle eliminates need to remove handle from socket after each forward turn.

**SCREWDRIVER SOCKET**
Slotted, crosspoint, clutch, hex, or other screwdriver blade attached to a socket to allow its use with various wrench handles.

**SET-SCREW SOCKET**
Male hex blade attached to a socket to allow its use with various wrench handles.

**SLIDING-T**
Fixture which mates with socket can be slid along a straight bar to provide desired degree of torque and one-hand or two-hand operation.

**SOCKET**
A cap (with provision for turning by a handle or driver) that fits snugly over a bolt or nut. May have 4, 6, 8, or 12 points to match various fasteners.

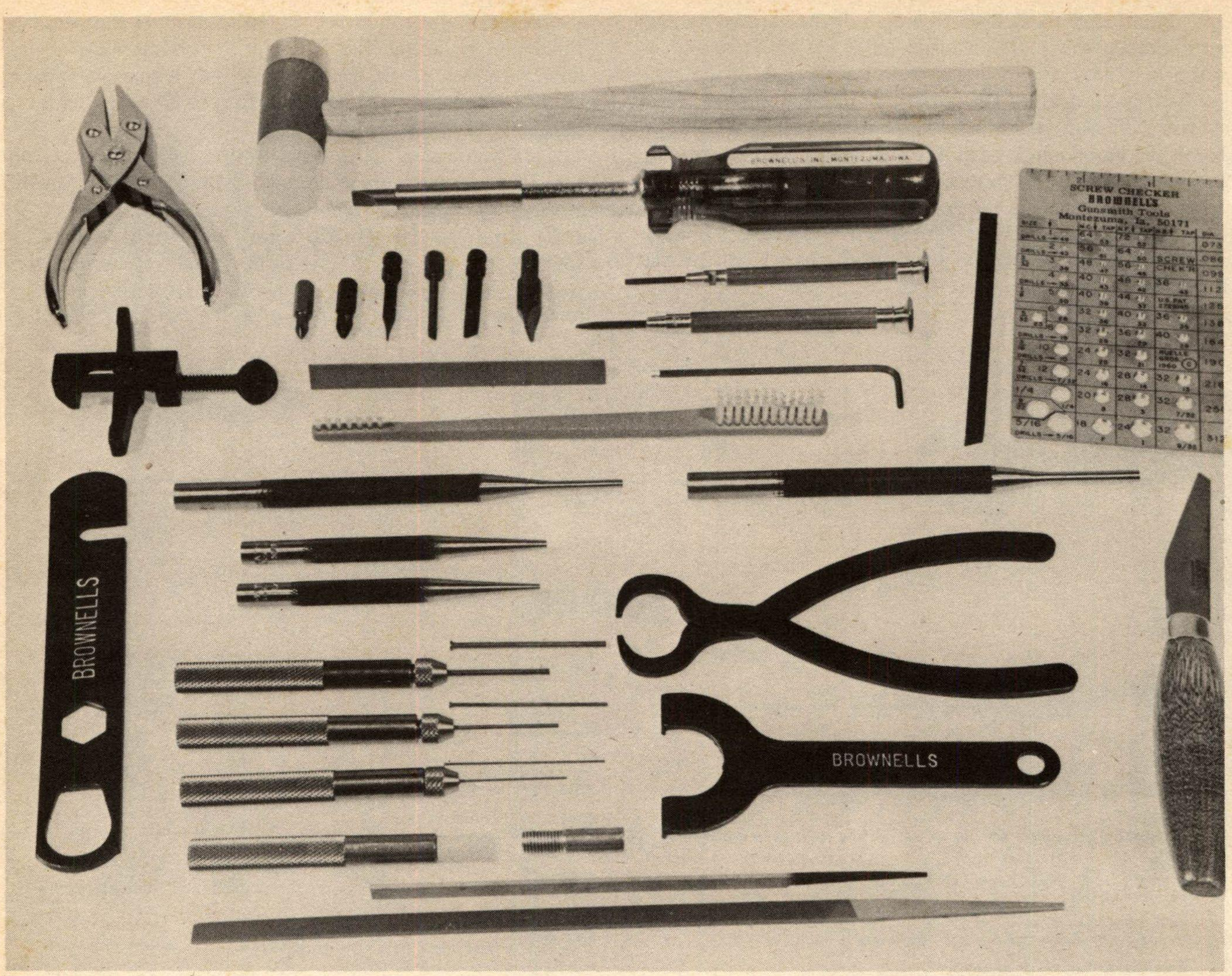
**SPINNER**
Screwdriver-appearing tool used to turn sockets.

**SPLINE**
Male wrench head usually has four or six flutes.

**STILLSON**
Adjustable wrench with serrated jaws for holding pipe.

**TORQUE**
Wrench has a torque indicator built into the tool to tell operator how much force is being exerted.

**UNIVERSAL JOINT**
Adapts a straight handle to a socket and allows it to be operated at an angle.



*The tools in Brownells' Beginner's Set. Future sets will be for specific guns and for advanced gunsmithing.*

brass, and on wood it acts as an extra-fine sandpaper and moulds itself to match any contour. Most paint and hardware stores, plus gunsmith supply houses, stock it in inexpensive rolls or pads.

With reproduction-replica kits or antique muzzleloaders, there is little requirement for welding. Should the need arise, however, select a micro or aircraft-size oxyacetylene welding rig from your local welding supply house. You will need only a small-size unit, but unless you have previous experience I would recommend that you purchase and read *The Oxyacetylene Welder's Handbook.*

A good hand-held propane torch will fill most of your needs. There are numerous brands on the market, but the best one I have found to date is the Bernz-o-matic jet torch, as it has a hotter and more concentrated flame tip. You can buy it as a kit, but the contents of the kit are of little value in gun work. Just buy the regulator and tip and use the savings for extra propane cylinders.

Most soldering needs can be handled with two types of solder. Brownell's Hi-Force 44 solder is unique. It contains no lead, as is found in most solder, instead it is comprised of four percent silver and ninety-six percent tin. It has from 14,000 to 15,000 pounds per square inch sheer strength, making it from five to ten times stronger than regular tin-lead soft solder; yet it melts and flows at 475 degrees Fahrenheit, well within the range of a propane torch. Be sure to use the flux specially designed for this solder.

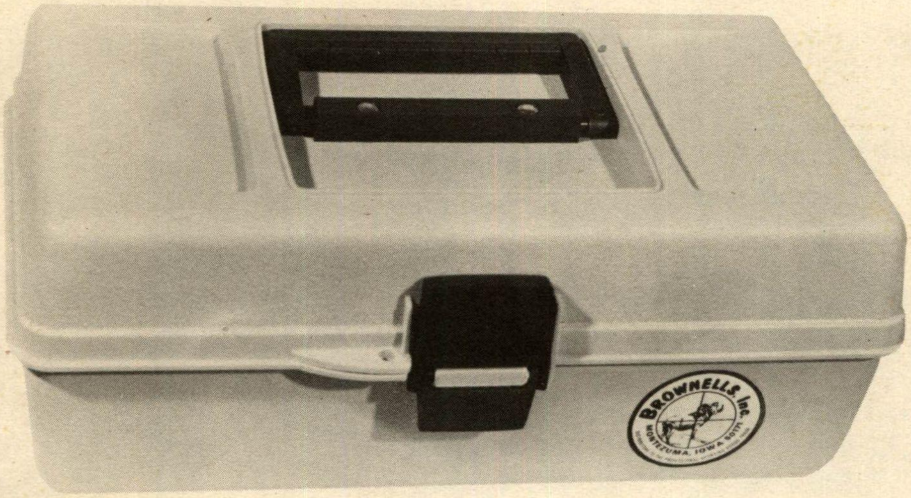
The second type is one I helped develop and is also marketed by Brownell's as Gunsmiths Soft Solder. It is a noncorrosive, multiple rosin, core flux solder that does not require extra flux. It melts at the extremely low

temperature of 370 degrees Fahrenheit, and is the only solder that will bond to other old solder. As an added attraction, it will not bond to a blued surface. It has 7600 pounds per square inch sheer strength, about double that of common fifty-fifty lead-tin soft solder.

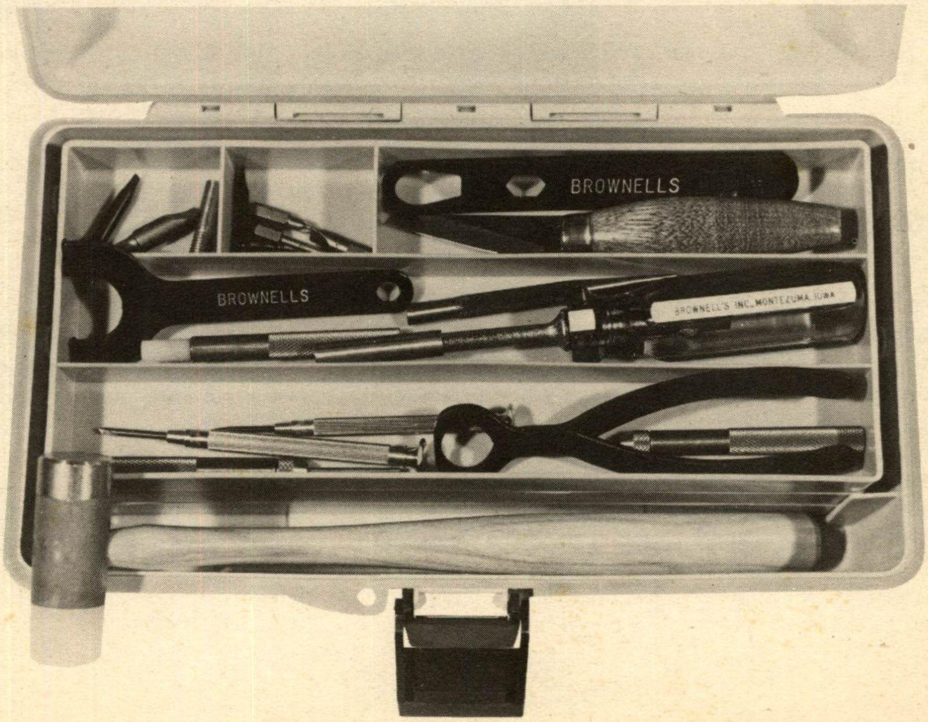
These two solders will limit the need for gunsmith silver solder, which melts at 1125 degrees Fahrenheit; about maximum limit with a propane torch. If the need arises, you still can silver solder by simply using the combined flame of two propane torches. It is a bit slow, but will work. Silver solder, incidentally, is incorrectly named. A more correct term would be silver braze, as it usually contains silver, brass and copper, but no tin or lead.

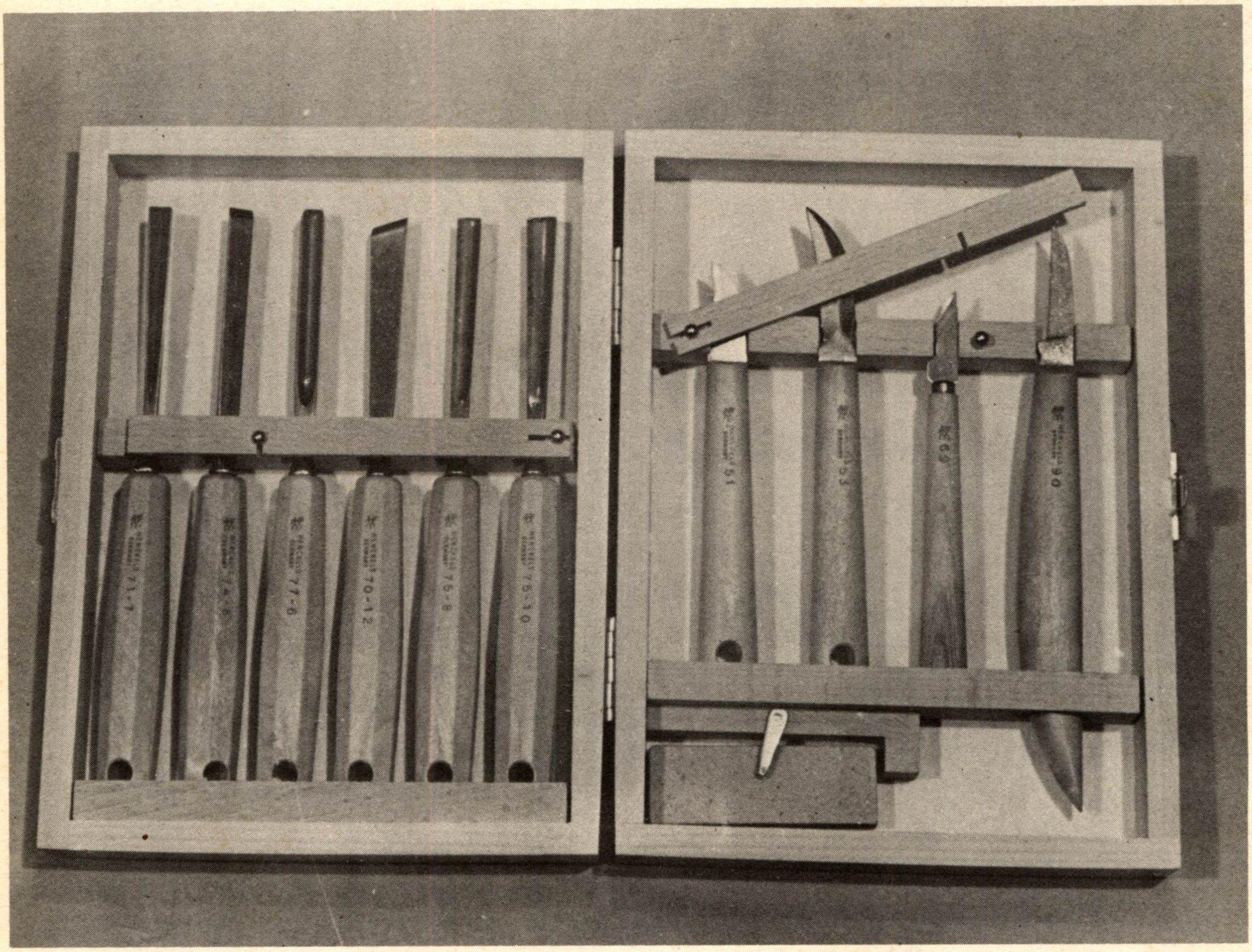
While on the subject of heat and torches, a gunsmithing requirement often run into is the re-case hardening of sear notches, pins and similar parts. The old method required the use of cyanide in some form. Personally, I have a big, yellow streak down my back when it comes to working with this extremely dangerous stuff! If you doubt the danger, just ask any knowledgeable chemist.

Thankfully, there is no need to use cyanide to achieve excellent case hardening. Kasenit, a nonpoisonous, nonexplosive and nonflammable product, comes with easy-to-follow instructions printed on the can, and will produce an extremely good case hardened surface on all classes of steel and wrought iron.




*Brownells' Beginner's Tool Set is the first of a series. The heavy-duty case is pictured above. Below is a view of the many compartments.*





*The J.A. Henckle No. 7 chisel set, distributed by Brownells, is a set of the six most-used chisels, and four of the most-used carving and inletting knives, plus sharpening stone in a wooden case.*

**WOODWORKING TOOLS**

It would require a complete, rather thick chapter to fully explain each woodworking tool, but our concern is only with basic requirements. Just as in metalworking, you will gradually add more and more tools as you progress into the more complicated aspects of black powder gunsmithing. The same golden rule applies. Purchase tools only as needed, and then buy the best quality you can afford.

The primary tool is the carving or inletting chisel. It also is the most important; good chisels make stockwork easy when compared to poor grade chisels that require constant sharpening.

During my gunsmithing career I have made and bought just about every brand of chisel at one time or another. The finest I know of are J.A. Henckle's Twin Brand and Acorn Brand. They are truly beautiful instruments that hold a sharp edge for longer than any other I have used. Up until recently the only problem was selecting the most useful shapes. They now offer a set that will fill fully ninety-five

percent of your needs. The set, consisting of six chisels selected for maximum versatility, also contains four special woodworking knives with blade shape chosen specifically for stockwork requirements. The set comes in a wood case with each tool locked in place, and also contains the correct sharpening stone. The set is not cheap, but given proper care these tools will last a lifetime.

As most black powder guns use carvings instead of checkering, the required tools must be smaller than the regular inletting and stock chisels. Brownell's offers an ideal six-tool set called Palm Chisels. Also included is a round, mushroom-type handle that fits perfectly in the palm of your hand. The high-carbon tool steel is precision ground, hardened, polished and stoned to a razor sharp edge. The set is not expensive and is a pleasure to use.

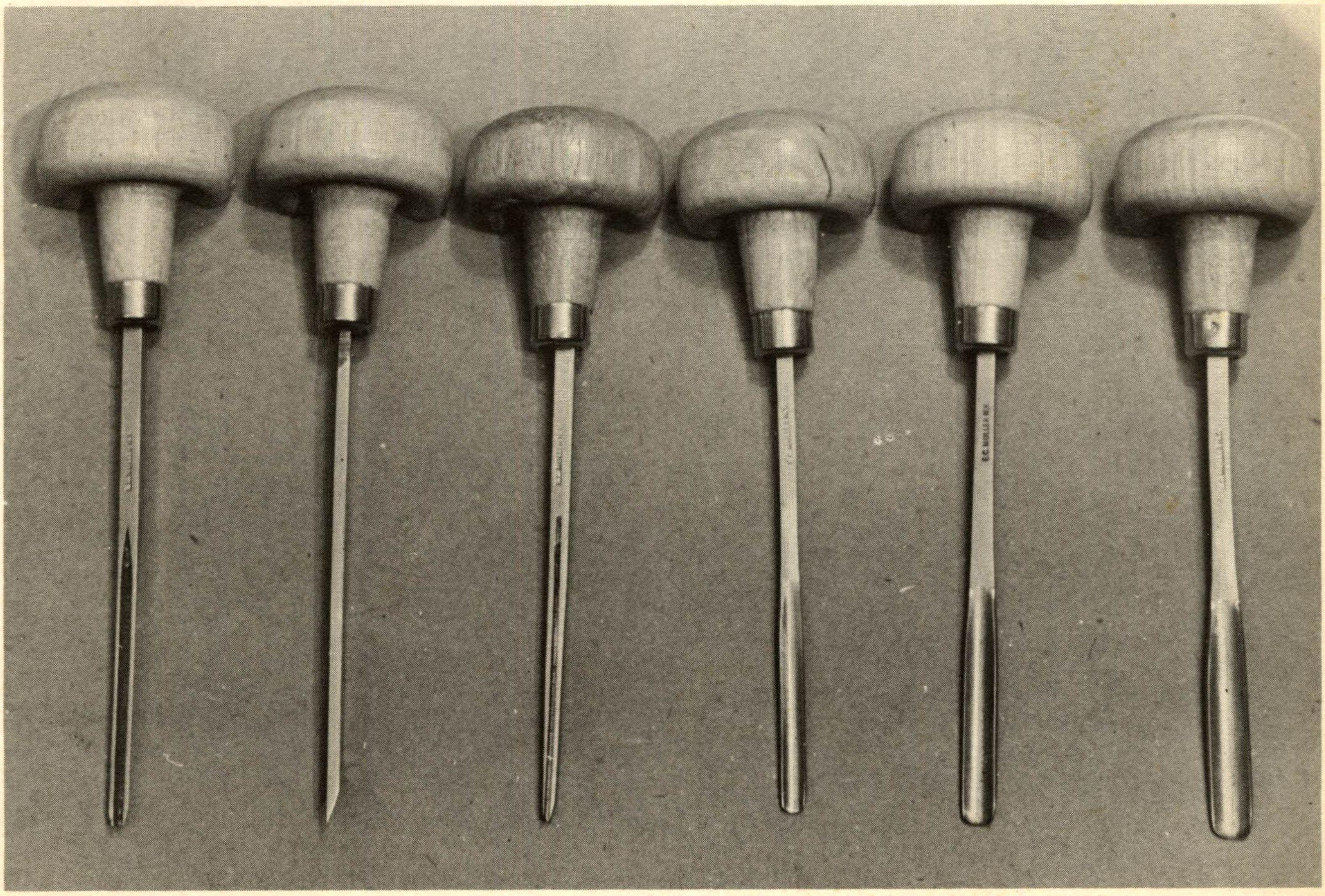
Scrapers are used to remove small amounts of wood for close fitting. There are several good brands on the market; unfortunately, most are designed for modern gun-type stocks. The best I know of for black powder guns are the Brownell scrapers; they are short, which gives fingertip control when the blade is held at right angles to the handle. You can scrape a curl of wood or, with light pressure, just wood dust! Blade widths are one-quarter, three-eighths and one-half-inch, and each is available in curled or flat-end blade for a total of six tools in a full set.

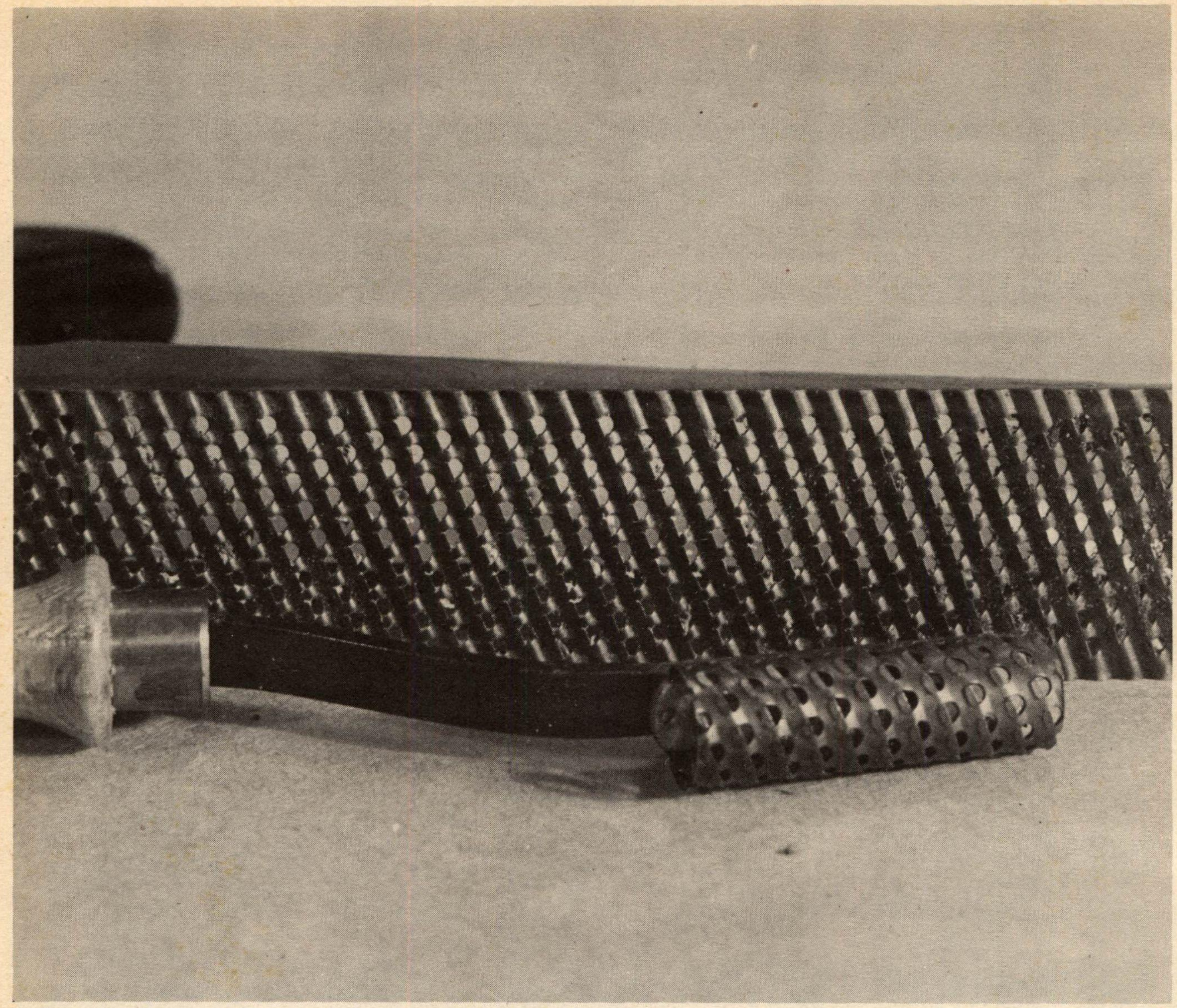
As previously stated in the discussion on files, the four-in-hand wood rasp will answer most rasp requirements. There are other wood rasps, of course, but add them only if you think the need justifies the cost.

The Surform file and Surform plane have just about replaced most rasps and carpenter's planes in woodworking. Each consists of two parts, a handle and replaceable blade. Key to performance is the blade, which consists of a series of angular holes with the metal pushed downward to form the cutting edge. The blades require no adjustment, and come in coarse and fine cut. When pushed across a piece of wood, the tiny blade cuts the wood, which passes up through the holes. These tools virtually eliminate digging and gouging of the wood. Both are available at hardware stores and gunsmith supply houses, at a cost far less than a carpenter's plane.

The spoke shave, used by some woodworkers, is an old

*Palm chisels are actually small inletting chisels for precision inletting in close places where a regular chisel will not fit. Also used for wood carving.*





*Surform tools for wood: The barrel channel tool (front) and the regular plane (rear) are most useful in gunstock work as there is no gouging.*

tool originally designed to make spokes for a wooden wagon wheel. In reality, it is a small, two-handed plane, but the short blade allows it to be used on either flat or round surfaces. Many stockmakers prefer it to any similar tool.

A draw knife also is an old, two-handed tool primarily used in roughing out a stock blank. It is a difficult tool to learn to use correctly, and I would not recommend it for a beginner. I learned to use it years ago, but even today I have to watch the wood grain and keep the cutting angle correct or it will gouge out a chunk of wood in seconds.

An alternative method of shaping the outside of a stock is via a scraper. While a common pocketknife with a thick blade can be used, you easily can make a better tool. Visit your local cabinet shop and ask if they have any worn, power planer blades. These blades vary in length, but are about one-quarter inch thick and around an inch wide. The edge is ground at about a thirty-degree angle on only one side, the other side being flat. The metal is extremely tough, but with a good stone maintaining the original cutting angle, you can keep it razor sharp. Incidentally, planer blades can be ground to other shapes and uses. I have a miniature draw knife made from one that is a jewel.

In use, the scraper is held in both hands with the cutting edge ninety degrees from the stock. Starting at the large end of the stock and, with mild pressure, draw the scraper toward you. A thin curl of wood will be removed. You just

keep repeating this stroke. The main advantage is that you avoid dips and unwanted curves in the wood. With care you can shape the stock almost to the sandpaper stage.

Selecting the correct type and grit of sandpaper can be confusing. While there are variations, most sandpaper can be separated into three basic types. Each is simply some form of grit bonded to a paper or cloth backing. Garnet paper, the most common and least expensive, has a tendency to clog up with sawdust quickly and is best used for the first rough sanding – being selected in large grit size. The second and a bit more expensive type is silicon carbide paper. It comes in a variety of grit sizes and has less tendency to clog with wood dust. The third and best is aluminum oxide, usually bonded to cloth. It has a long, useful time span and does not clog easily. If it does clog, you usually can clean it with fine steel wool.

Hardware stores usually sell all three as coarse, medium and fine grit. This is a simple system and all right for household use, but leaves a lot to be desired for gun stocks. Most large paint stores and gunsmith supply houses have a better system. The sandpaper or cloth grit is designated in units of 10, with the larger the number, the finer the grit. Starting with the coarsest, the grits used for stockwork are 100, 180, 280, 320, 400 and 600. The 400 and 600 are for extra-fine sanding, primarily on hard wood.

Purchase a few sheets of each and you will soon select the grits you like best. The one rule in using any sandpaper is to avoid sanding across the grain of the wood. Sand with the grain and you will avoid difficult-to-remove scratches caused by sanding across the grain.

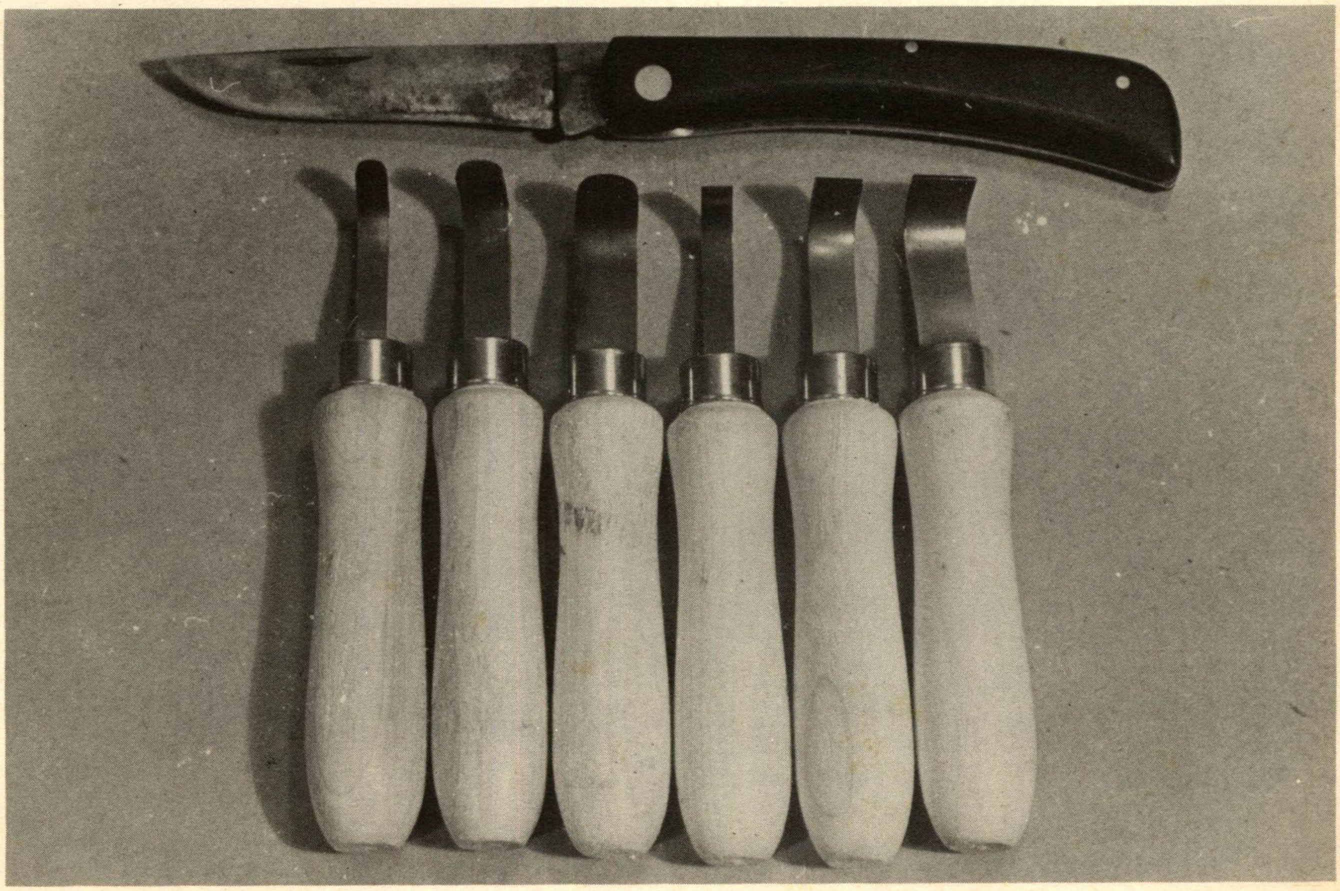
Sandpaper is cheap; when it clogs up change to another piece. Small blocks of wood or metal used as a backing for sandpaper will speed up the job. Most people simply stop sanding too soon, and then wonder why the stock looks bad under the finish. Take your time, use plenty of elbow grease, decrease slowly to the finer grits, remove all scratches, and get the wood slick as glass. Then, and then only, are you ready to begin the staining and finishing stages.

All surfaces, metal or wood, have one thing in common: the smoother the better. The components of an action will function better if all parts are smooth, simply because there is less friction. A professional gunsmith will always tell you that the correct preparation of the surface is ninety percent of the secret in a blue job or stock finish.

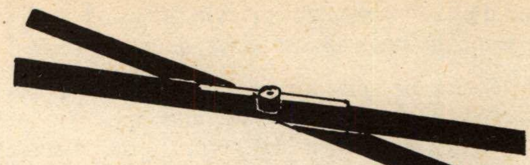
The tools mentioned in this chapter are far from being all that are available. Even so, the beginner may be startled as he visualizes the dollars flowing out of his wallet. To purchase in one big order all those listed would be a mistake.

The more sensible method is to purchase your tools as needed and learn to use each one correctly – a good job depends not on the tool, but how it is used.

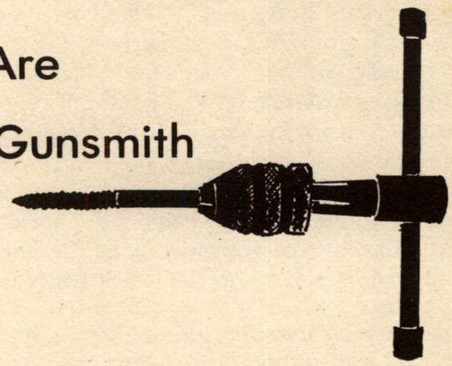
*Brownells' Hard Fit Curl Scrapers feature a scraping edge at an exact ninety-degree angle to the handle to prevent gouging. The common single-bladed pocketknife is used for scraping the sides of a stock.*



CHAPTER 3

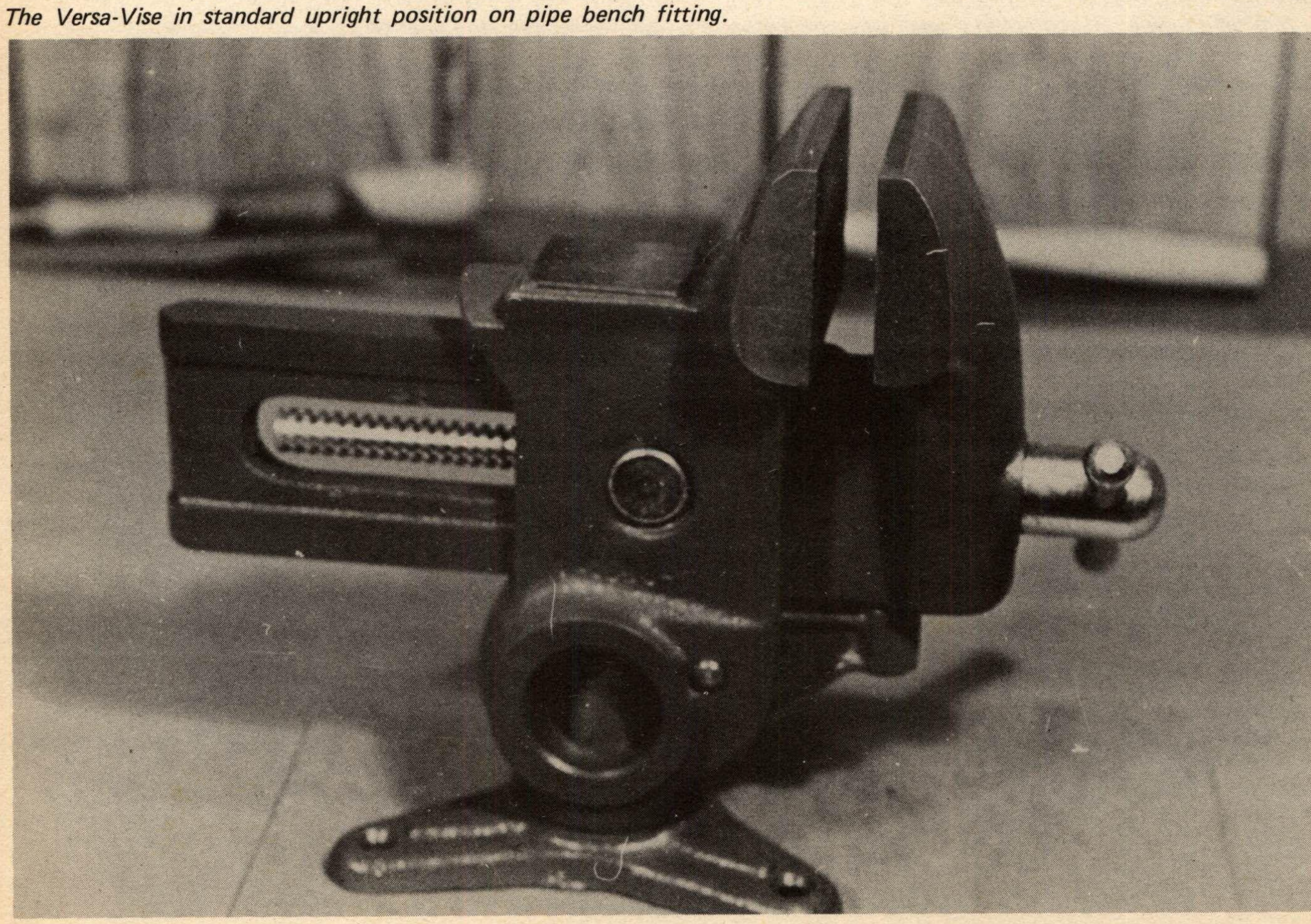


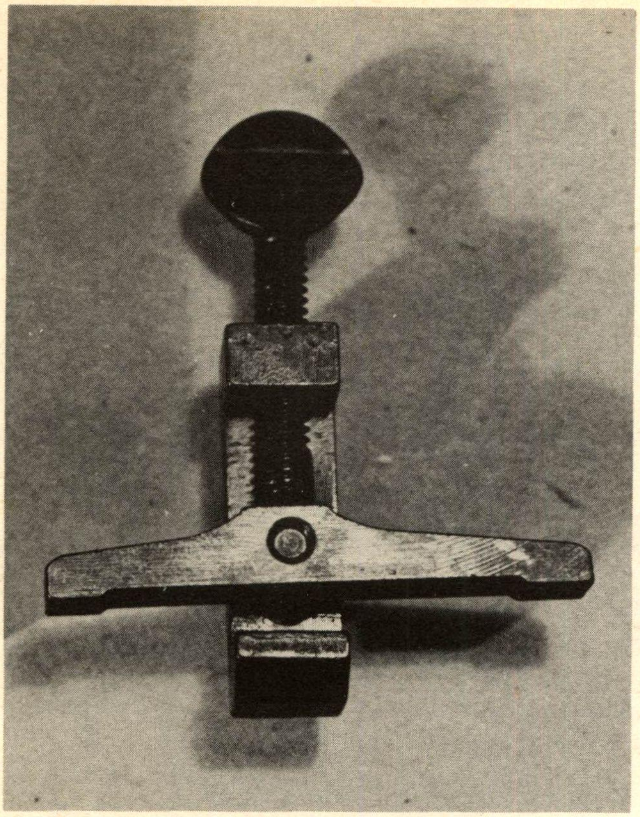
# SHOP TOOLS AND ACCESSORIES



## Specialized Items That Are Essential To The Black Powder Gunsmith

*The Versa-Vise in standard upright position on pipe bench fitting.*





*The Nicky Mainspring Vise is used to hold tension as mainspring is removed from lock and to prevent sudden loss of compression.*

SHOP TOOLS and accessories simply extend the versatility of hand tools and make the work easier. Even so, the total required will only fill a normal-size suitcase. The same golden rule of purchasing only as needed and obtaining the best quality you can afford is equally true.

The most important shop tool is a vise, and although there are many shapes and sizes, there are only two basic types: temporary clamp-on, and permanently mounted. In my opinion, the temporary clamp-on types are useless in gun work. They are invariably fragile and will not open wide enough or hold work firmly enough for general gunsmithing, even on a kitchen table arrangement. If you do not have a workbench, mount the permanent type on a good board and then use C clamps to attach it to a kitchen or picnic table. This arrangement is used by many hobbyists and, although not the ideal solution, they at least have a vise big enough and strong enough to hold the work firmly and steadily.

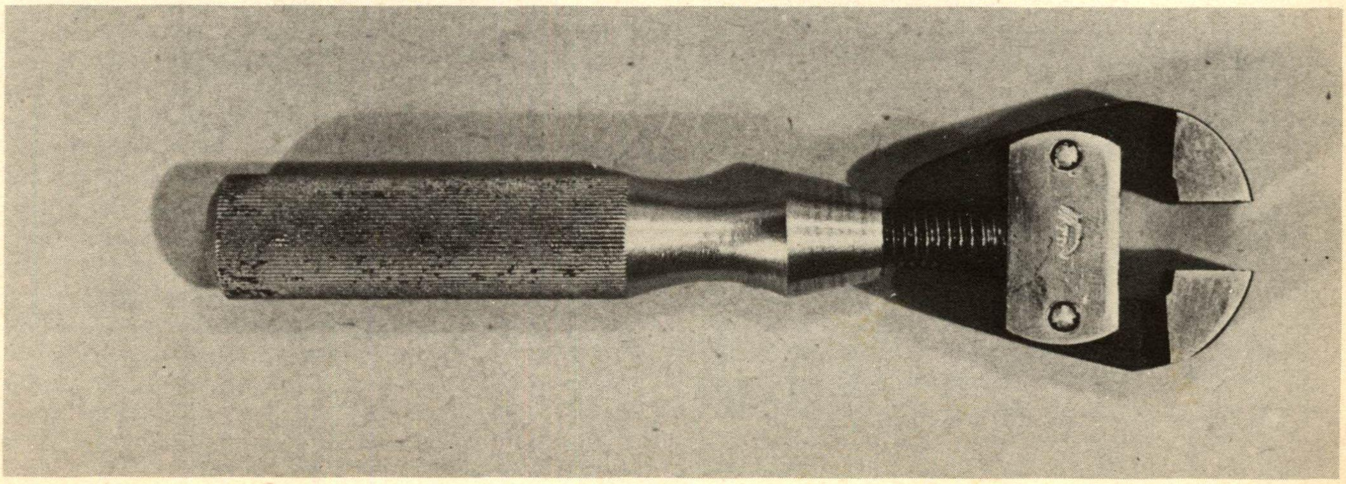
The most common type found in gunsmithing shops is a machinist's vise, with jaw widths hanging from three to six inches. The width of the jaws is a factor in how massive and how expensive the vise will be. The four-inch vise usually is the most common, although the three-inch may be the only choice if shop space is an important factor. The screw that opens and closes the jaws should be enclosed, or have a sliding shield, to prevent filings from getting on the screw. Another important factor is that the base of the vise should be of the swivel type, allowing the top to turn at least ninety degrees.

The next most common type is the Versa-Vise, similar in appearance to the machinist's vise except that it affords a full 360 degrees of swivel. Also, the top section can be removed from the upright, pipe base section, turned sideways and mounted on the pipe base in this position. Thus, the jaws can be positioned either horizontally or vertically. It looks light, but is strong because it is made of cast semisteel.

Regardless of which vise you purchase, you should make several sets of vise jaw pads. To do so, cut a pattern out of heavy cardboard. The pattern should look like an upside down capital letter U, except squared off where the curve is. The arms should extend over the vise screw projector, the sides equal to the width of the jaws, and the top flush with the top of the jaws. Scrap pieces of one-quarter-inch plywood or masonite make good, inexpensive pads. Glue some thick leather to the top of the pads and you have an even better set. A piece of scrap carpet large enough to fill the jaw openings will prove useful when a finished stock is held in the vise.

A small, hand-held pin vise is a useful addition; its small jaws make the tiny pins and screws easier to hold and more accessible. It can be mounted in your larger vise if desired,

*Hand-held pin vise has cam-type action in opening/closing. Hollow handle for holding long pins. May be clamped in bench vise with mild pressure on tool. Holds small pins, screws in precision work.*



but be sure to use padded vise jaws to protect the handle.

The rear end of muzzleloading barrels is closed by a screw-in breech plug or breech tang. It is a tight fit, even when new, as its purpose is to seal the rear of the barrel and contain the pressure when the gun is fired. After prolonged firing, plus age, removal becomes a major problem. To add to the merriment, it appears that every gunmaker decided to make the tang or plug a different size, with the tapered sides every angle known to man.

Regular barrel vises and wrenches seldom work. Crescent wrenches, open end wrenches, and pipe wrenches may get the plug out, but result in deep scars and burrs ninety percent of the time. At one time the only solution was to machine or forge a wrench to the correct shape; after a while you had enough wrenches to fill the back of a pickup truck.

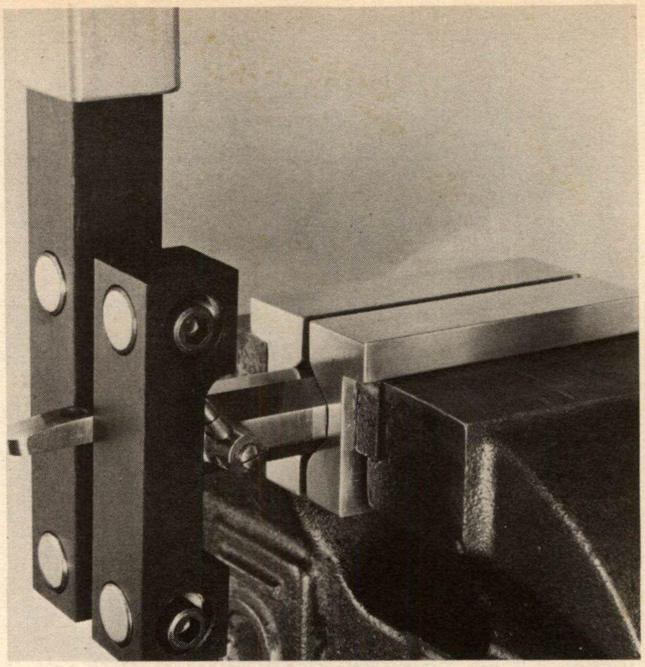
Dan Bechtel of the B-Square Company finally came up with the answer: a two-part set or kit. To hold the barrel he designed a pair of heavy-duty aluminum vise jaws that fit a standard machinist vise. The jaws have an octagonal opening that holds the barrel securely – and will also hold round barrels. While designed for breech plug removal, the nonmarring jaws are ideal to hold the barrel while filing sight slots or performing other barrel work.

The second part of the set is the breech plug or tang wrench. Two pieces of one-inch-square tool steel – one eight inches long and the other four inches long – are joined by two large socket head bolts. The bolts, however, do not screw into the two pieces of inch-square stock; instead, they pass through two hardened, round steel plugs on the long section and are threaded into two similar plugs on the short section. This allows the two sections to be spaced parallel for any size square or rectangular-shaped plug. More important, tightening the bottom screw and loosening the top screw allows the steel plugs in the wrench to rotate and allows the sides of the wrench to be set to exactly match the tapered sides of any breech plug or tang. Tighten the two screws and you have a perfect nonmarring fit.

You can, of course, use the impact principle, which is a fancy way of saying hit the long end with a hammer and the jar will loosen the most stubborn breech plug screw or tang.

Another method is to use the two-foot extension handles that come with the wrench. One word of caution! Thoroughly soak the breech plug or tang screw with penetrating oil. The wrench is so powerful that you can wring the breech plug or tang off if it is stuck in an old barrel. The wrench and vise jaws are ideal for installing breech plugs or tangs.

A problem almost equal to breech plugs and tang screws is the removal of nipples from percussion rifles, muskets, shotguns, pistols and revolvers. Again, you have the same situation of a variety of sizes on the old, original nipples and the modern, reproduction-replica guns. There is no one tool for all. The only answer is to purchase those made by Michaels of Oregon, the Thompson/Center wrench and the seven-piece set offered by Dixie Gun Works. They are not expensive and will remove nipples without marring or burring, plus they'll last a lifetime with reasonable care. Replacement nipples are available from all three companies. If you are not restoring an antique, I recommend the



*B-Square's Breech Plug Wrench removes frozen breech or taper plugs from muzzle-loading rifles or pistols without damage.*

stainless-steel nipples manufactured by Michaels. Rust and corrosion are eliminated.

Flat springs are easily broken if the tension is suddenly removed when disassembling a lock. This possibility is eliminated if you use the small, inexpensive mainspring vise offered by Brownell's. Cock the action, then slip the vise over the spring. The cross arm of the vise will adjust automatically. Now tighten the thumb screw until you feel slight pressure. Trip the sear of the lock and all lock pressure is removed from the spring. Ease the spring out of the lock and slowly release the spring tension by unscrewing the vise thumb screw. To install the spring in the lock, just tighten the thumb screw to compress the spring.

Regardless of what type of gunsmithing you do, there are holes to be drilled. There are three U.S. sets: First is the fraction set, beginning with one-sixty-fourth-inch diameter and continuing up to one inch diameter. Next is the number set, sometimes called the wire gauge set. This set actually starts at number 80, the smallest diameter, but most sets begin with number 60 and continue increasing up to number 1, the largest diameter. This is the set most used in gun work, as machine screws are based on these drills. Last, and the least used, is the letter drill set beginning with number A, the smallest diameter, and ending with number Z, the largest diameter. The letter set is intended to begin in diameter where the number set ends.

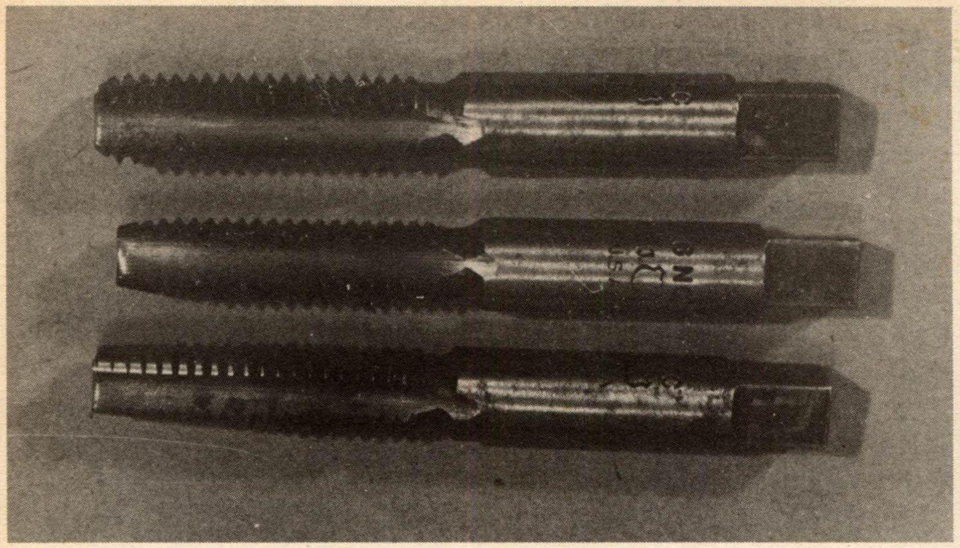
With the large volume of imported guns today, you'll more than likely run into metric requirements. The simple answer is to purchase individual drills; however, a set of numbered drills, 1-60, will fill most requirements and is cheaper if purchased as a set in a metal box container holding each drill separately. Now add the fraction drills running from one-sixteenth up to one-half inch. From a

## STANDARD DRILL SIZES
### DECIMAL EQUIVALENTS

| Drill | Decimal | Drill | Decimal | Drill | Decimal |
|---|---|---|---|---|---|
| 80 | .0135 | 1/8 | .1250 | O | .3160 |
| 79 | .0145 | 30 | .1285 | P | .3230 |
| 1/64 | .0156 | 29 | .1360 | 21/64 | .3281 |
| 78 | .0160 | 28 | .1405 | Q | .3320 |
| 77 | .0180 | 9/64 | .1406 | R | .3390 |
| 76 | .0200 | 27 | .1440 | 11/32 | .3438 |
| 75 | .0210 | 26 | .1470 | S | .3480 |
| 74 | .0225 | 25 | .1495 | T | .3580 |
| 73 | .0240 | 24 | .1520 | 23/64 | .3594 |
| 72 | .0250 | 23 | .1540 | U | .3680 |
| 71 | .0260 | 5/32 | .1562 | 3/8 | .3750 |
| 70 | .0280 | 22 | .1570 | V | .3770 |
| 69 | .0292 | 21 | .1590 | W | .3860 |
| 68 | .0310 | 20 | .1610 | 25/64 | .3906 |
| 1/32 | .0313 | 19 | .1660 | X | .3970 |
| 67 | .0320 | 18 | .1695 | Y | .4040 |
| 66 | .0330 | 11/64 | .1719 | 13/32 | .4062 |
| 65 | .0350 | 17 | .1730 | Z | .4130 |
| 64 | .0360 | 16 | .1770 | 27/64 | .4219 |
| 63 | .0370 | 15 | .1800 | 7/16 | .4375 |
| 62 | .0380 | 14 | .1820 | 29/64 | .4531 |
| 61 | .0390 | 13 | .1850 | 15/32 | .4688 |
| 60 | .0400 | 3/16 | .1875 | 31/64 | .4844 |
| 59 | .0410 | 12 | .1890 | 1/2 | .5000 |
| 58 | .0420 | 11 | .1910 | 33/64 | .5156 |
| 57 | .0430 | 10 | .1935 | 17/32 | .5313 |
| 56 | .0465 | 9 | .1960 | 35/64 | .5469 |
| 3/64 | .0469 | 8 | .1990 | 9/16 | .5625 |
| 55 | .0520 | 7 | .2010 | 37/64 | .5781 |
| 54 | .0550 | 13/64 | .2031 | 19/32 | .5938 |
| 53 | .0595 | 6 | .2040 | 39/64 | .6094 |
| 1/16 | .0625 | 5 | .2055 | 5/8 | .6250 |
| 52 | .0635 | 4 | .2090 | 41/64 | .6406 |
| 51 | .0670 | 3 | .2130 | 21/32 | .6562 |
| 50 | .0700 | 7/32 | .2188 | 43/64 | .6719 |
| 49 | .0730 | 2 | .2210 | 11/16 | .6875 |
| 48 | .0760 | 1 | .2280 | 45/64 | .7031 |
| 5/64 | .0781 | A | .2340 | 23/32 | .7188 |
| 47 | .0785 | 15/64 | .2344 | 47/64 | .7344 |
| 46 | .0810 | B | .2380 | 3/4 | .7500 |
| 45 | .0820 | C | .2420 | 49/64 | .7656 |
| 44 | .0860 | D | .2460 | 25/32 | .7812 |
| 43 | .0890 | E | .2500 | 51/64 | .7969 |
| 42 | .0935 | 1/4 | .2500 | 13/16 | .8125 |
| 3/32 | .0938 | F | .2570 | 53/64 | .8281 |
| 41 | .0960 | G | .2610 | 27/32 | .8438 |
| 40 | .0980 | 17/64 | .2656 | 55/64 | .8594 |
| 39 | .0995 | H | .2660 | 7/8 | .8750 |
| 38 | .1015 | I | .2720 | 57/64 | .8906 |
| 37 | .1040 | J | .2770 | 29/32 | .9062 |
| 36 | .1065 | K | .2810 | 59/64 | .9219 |
| 7/64 | .1094 | 9/32 | .2812 | 15/16 | .9375 |
| 35 | .1100 | L | .2900 | 61/64 | .9531 |
| 34 | .1110 | M | .2950 | 31/32 | .9688 |
| 33 | .1130 | 19/64 | .2969 | 63/64 | .9844 |
| 32 | .1160 | N | .3020 | 1 | 1.000 |
| 31 | .1200 | 5/16 | .3125 | | |

## MILLIMETER SIZES
### DECIMAL EQUIVALENTS

| mm | Decimal | mm | Decimal | mm | Decimal |
|---|---|---|---|---|---|
| .35 mm | .0138 | 3.4 mm | .1339 | 8. mm | .3150 |
| .4 mm | .0157 | 3.5 mm | .1378 | 8.1 mm | .3189 |
| .45 mm | .0177 | 3.6 mm | .1417 | 8.2 mm | .3228 |
| .5 mm | .0197 | 3.7 mm | .1457 | 8.25 mm | .3248 |
| .55 mm | .0217 | 3.75 mm | .1477 | 8.3 mm | .3268 |
| .6 mm | .0236 | 3.8 mm | .1496 | 8.4 mm | .3307 |
| .65 mm | .0256 | 3.9 mm | .1535 | 8.5 mm | .3346 |
| .7 mm | .0276 | 4. mm | .1575 | 8.6 mm | .3386 |
| .75 mm | .0295 | 4.1 mm | .1614 | 8.7 mm | .3425 |
| .8 mm | .0315 | 4.2 mm | .1654 | 8.75 mm | .3445 |
| .85 mm | .0335 | 4.25 mm | .1674 | 8.8 mm | .3465 |
| .9 mm | .0354 | 4.3 mm | .1693 | 8.9 mm | .3504 |
| .95 mm | .0374 | 4.4 mm | .1732 | 9. mm | .3543 |
| 1. mm | .0394 | 4.5 mm | .1771 | 9.1 mm | .3583 |
| 1.05 mm | .0413 | 4.6 mm | .1811 | 9.2 mm | .3622 |
| 1.1 mm | .0433 | 4.7 mm | .1850 | 9.25 mm | .3642 |
| 1.15 mm | .0453 | 4.75 mm | .1870 | 9.3 mm | .3661 |
| 1.2 mm | .0472 | 4.8 mm | .1890 | 9.4 mm | .3701 |
| 1.25 mm | .0492 | 4.9 mm | .1929 | 9.5 mm | .3740 |
| 1.3 mm | .0512 | 5. mm | .1968 | 9.6 mm | .3780 |
| 1.35 mm | .0531 | 5.1 mm | .2008 | 9.7 mm | .3819 |
| 1.4 mm | .0551 | 5.2 mm | .2047 | 9.75 mm | .3839 |
| 1.45 mm | .0571 | 5.25 mm | .2067 | 9.8 mm | .3858 |
| 1.5 mm | .0591 | 5.3 mm | .2087 | 9.9 mm | .3898 |
| 1.55 mm | .0610 | 5.4 mm | .2126 | 10. mm | .3937 |
| 1.6 mm | .0629 | 5.5 mm | .2165 | 10.5 mm | .4134 |
| 1.65 mm | .0650 | 5.6 mm | .2205 | 11. mm | .4330 |
| 1.7 mm | .0669 | 5.7 mm | .2244 | 11.5 mm | .4528 |
| 1.75 mm | .0689 | 5.75 mm | .2264 | 12. mm | .4724 |
| 1.8 mm | .0709 | 5.8 mm | .2283 | 12.5 mm | .4921 |
| 1.85 mm | .0728 | 5.9 mm | .2323 | 13. mm | .5118 |
| 1.9 mm | .0748 | 6. mm | .2362 | 13.5 mm | .5315 |
| 1.95 mm | .0768 | 6.1 mm | .2401 | 14. mm | .5512 |
| 2. mm | .0787 | 6.2 mm | .2441 | 14.5 mm | .5709 |
| 2.05 mm | .0807 | 6.25 mm | .2461 | 15. mm | .5906 |
| 2.1 mm | .0827 | 6.3 mm | .2480 | 15.5 mm | .6102 |
| 2.15 mm | .0846 | 6.4 mm | .2520 | 16. mm | .6299 |
| 2.2 mm | .0866 | 6.5 mm | .2559 | 16.5 mm | .6496 |
| 2.25 mm | .0886 | 6.6 mm | .2598 | 17. mm | .6693 |
| 2.3 mm | .0905 | 6.7 mm | .2638 | 17.5 mm | .6890 |
| 2.35 mm | .0925 | 6.75 mm | .2658 | 18. mm | .7087 |
| 2.4 mm | .0945 | 6.8 mm | .2677 | 18.5 mm | .7283 |
| 2.45 mm | .0965 | 6.9 mm | .2716 | 19. mm | .7480 |
| 2.5 mm | .0984 | 7. mm | .2756 | 19.5 mm | .7677 |
| 2.55 mm | .1004 | 7.1 mm | .2795 | 20. mm | .7874 |
| 2.6 mm | .1024 | 7.2 mm | .2835 | 20.5 mm | .8071 |
| 2.65 mm | .1043 | 7.25 mm | .2855 | 21. mm | .8268 |
| 2.7 mm | .1063 | 7.3 mm | .2874 | 21.5 mm | .8465 |
| 2.75 mm | .1083 | 7.4 mm | .2913 | 22. mm | .8661 |
| 2.8 mm | .1102 | 7.5 mm | .2953 | 22.5 mm | .8858 |
| 2.9 mm | .1142 | 7.6 mm | .2992 | 23. mm | .9055 |
| 3. mm | .1181 | 7.7 mm | .3031 | 23.5 mm | .9252 |
| 3.1 mm | .1220 | 7.75 mm | .3051 | 24. mm | .9449 |
| 3.2 mm | .1260 | 7.8 mm | .3071 | 24.5 mm | .9646 |
| 3.25 mm | .1280 | 7.9 mm | .3110 | 25. mm | .9843 |
| 3.3 mm | .1299 | | | | |



*From top in this set of taps is a bottoming tap, a plug tap, and a starting tap. All taps are available in three versions.*

practical standpoint, the letter drills are best purchased individually on a need basis. By comparing the decimal equivalent of your drills with the decimal equivalent of metric drills, you usually can find a close match that will work in all but the most precise requirements.

Taps are made in a three-piece set for each size. The starter tap is tapered at the front with some of the thread ground off. As the name implies, its primary purpose is to start threading the hole. If the hole goes all the way through something, such as the side of a lock plate, the starter tap can do the complete job. If the hole does not go all the way through, you will need the plug tap. It is threaded full length except for a short taper on the tip. The last of the set is the bottoming tap, whose job is to thread the hole down to the bottom. If you can purchase only one tap, select the starter tap. Once the hole is started, grind back the tapered front end until you have a bottoming tap. Next time, buy another starter tap for the same size.

Every tap, and also every die, has two numbers, such as 6-32. The first number designates the machine screw diameter. The second number designates the number of threads in one inch, usually abbreviated as TPI. A 1/4-20 designation is read the same way, except the first number is a fraction size.

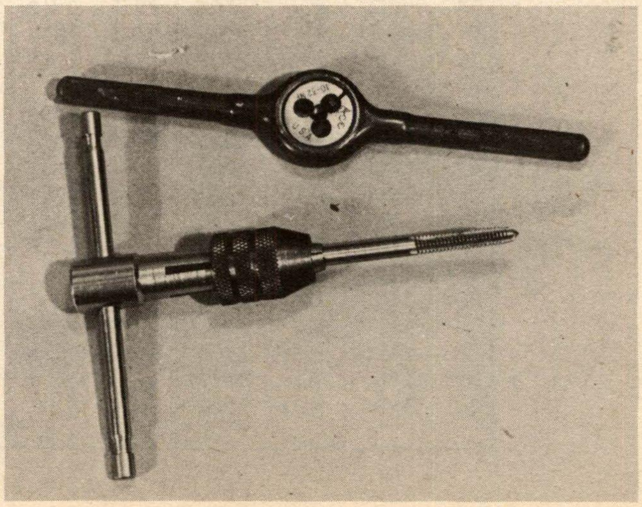
You will need a tap wrench to hold the tap when being used, and a die stock to hold the round die if threading a screw. You can purchase taps and dies, plus a tap wrench and die stock, all housed in a wooden box. If you choose to buy a starter kit, purchase it from a gunsmith supply house, as the selection of taps and dies will be the ones most often used in gunsmithing.

A good bench stone is a necessity, as there is always a tool that needs sharpening. There are two choices, man-made or natural. Natural stone is the best choice, as it is the only stone that both sharpens and polishes the metal. Starting with the coarsest, they are Washita, soft Arkansas, hard Arkansas and black hard Arkansas. The last is sometimes called surgical Arkansas, as it was used to sharpen old-style surgical tools. The best all-round choice is the Washita 2x1x6 inch. Inlet a small block of wood to hold the stone. Use one side for sharpening tools and keep the other side flat for smoothing the sides of gun parts before using your gunsmith stone kit. A few drops of honing oil will float away tiny metal particles that might become imbedded in the stone. Wipe the stone clean after use and if it becomes dark, clean it with a rag lightly soaked in mineral spirits.

A good, heavy-duty bench knife will find more uses than you can name. Although this is a matter of personal choice, I use a good, three-bladed Stockman's pocketknife.

Regular cleaning rods usually are too short for muzzleloading rifles and shotguns. The ramrod also serves as the cleaning rod. Most have a brass rear tip with a threaded extension to accept a brass screw for bullet or wad pulling, and a cleaning jag or loop. Another form of a bullet and wad puller is the corkscrew-type worm. You can either buy extra ramrods for shop use or make them from available parts. The fiberglass ramrods may not be authentic but they are almost unbreakable. Next in line are the hickory rods available from Dixie Gun Works; normal wood dowels are just too soft or brittle. The tips for cleaning

*Tap wrench with tap in place and die holder with die in place. One wrench size is okay, but die holder must be either 13/16 O.D. or one-inch O.D. die size.*




*Russell's bench Washita/Soft Arkansas stone with aluminum holder.*

rods are available from most gunsmith supply houses and Dixie Gun Works. Shop rods should have the emphasis on strength and durability, rather than appearance.

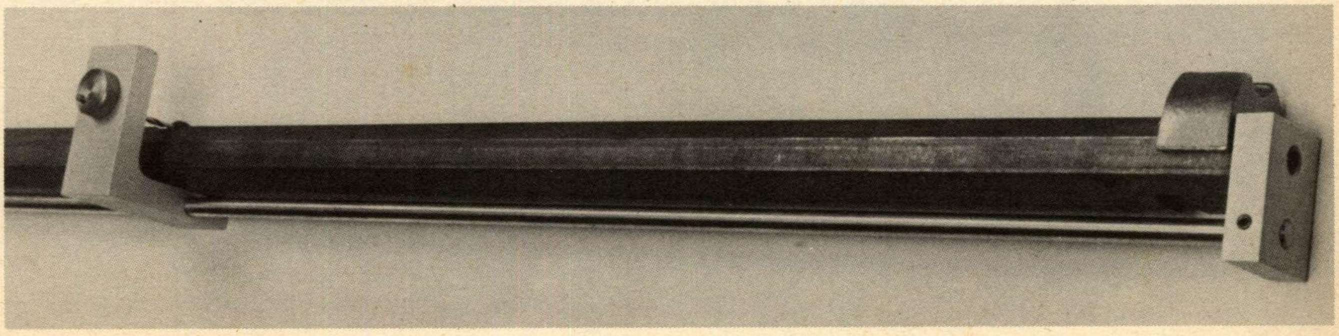
I have previously emphasized the importance of not using a steel or iron rod in a muzzleloader during cleaning when there is even the slightest trace of black powder and the possibility of these rods creating a spark. However, after a thorough cleaning with hot water and with all powder removed, a bore sometimes needs a good scrubbing. For this purpose, purchase two .30 caliber surplus military cleaning rods – the reason for buying two is so you will have an extra middle section to make the rod long enough. The end section will accept any commercial brass brush. A surplus, military .50 caliber machine gun cleaning rod with brass brushes is long enough and ideal for the large bore rifles. These rods are inexpensive, and will prove useful when a regular ramrod does not quite fill the need.

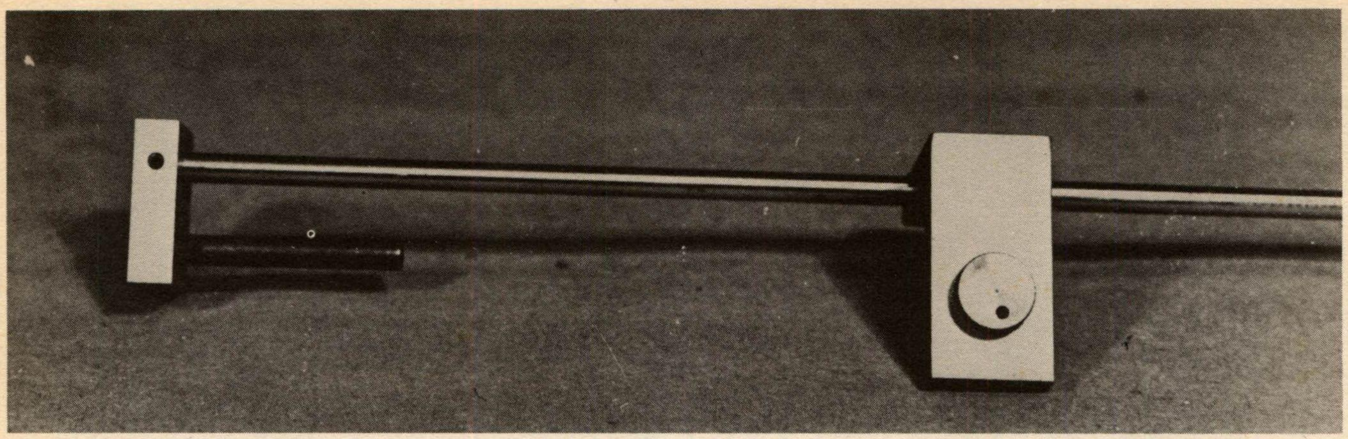
The barrels of most muzzleloading rifles are attached to the stock by a key or cross pin passing through both sides of the stock, and also by a short, metal flange on the bottom of the barrel. There usually are two or more such keys or cross pins. On many reproduction-replica rifles, the hole already is through the barrel flange, but not through the stock forend. Locating the exact position to drill the stock and match the barrel flange is an old problem, generally solved by as much measuring as possible and then pure luck. Quite recently the B-Square Company marketed a remarkably simple jig that eliminates the guesswork. Called the X-Ray Drill Jig, it works as follows:

The jig consists of a precision-ground rod, three feet long with a plate and pin attached to one end. An angle bracket slides on the rod and is held in place by a set screw. The sliding angle bracket has an eccentric drill bushing held by a set screw. The drill bushing has a 3/32-inch hole that can be positioned at the top, bottom, or any position in-between.

The fixed plate is positioned against the muzzle, the pin in the bore and the rod against the top of the barrel flat. Next, the sliding bracket is loosened and positioned over one of the predrilled barrel flanges with the rod pressed against the barrel. The eccentric bushing is loosened and, with the drill in its hole, aligned with the barrel flange hole. The bushing and sliding plate are not locked and the jig removed. The barrel is placed in its correct position in the stock, the jig then replaced back on the barrel in its original position. The eccentric drill bushing hole laying against the

*B-Square's X-Ray Jig is used to locate holes through the muzzleloading gunstock to align with the blind holes in the underside of the barrels.*





*Another view of B-Square's X-Ray Jig. Note eccentric bushing on sliding arm.*

side of the stock is then correctly aligned with the barrel flange hole. You have to drill through the wood as the guide bushing hole aligns the drill. If the barrel flange hole or wedge hole is larger than 3/32 inch, it is a simple matter to enlarge the holes in the stock, as the hard part of correct alignment is already completed. The additional barrel wedge or cross pins are aligned and drilled the same way by repositioning the sliding angle bracket and eccentric bushing. This jig is well worth the price as it can easily avoid damage to an expensive stock.

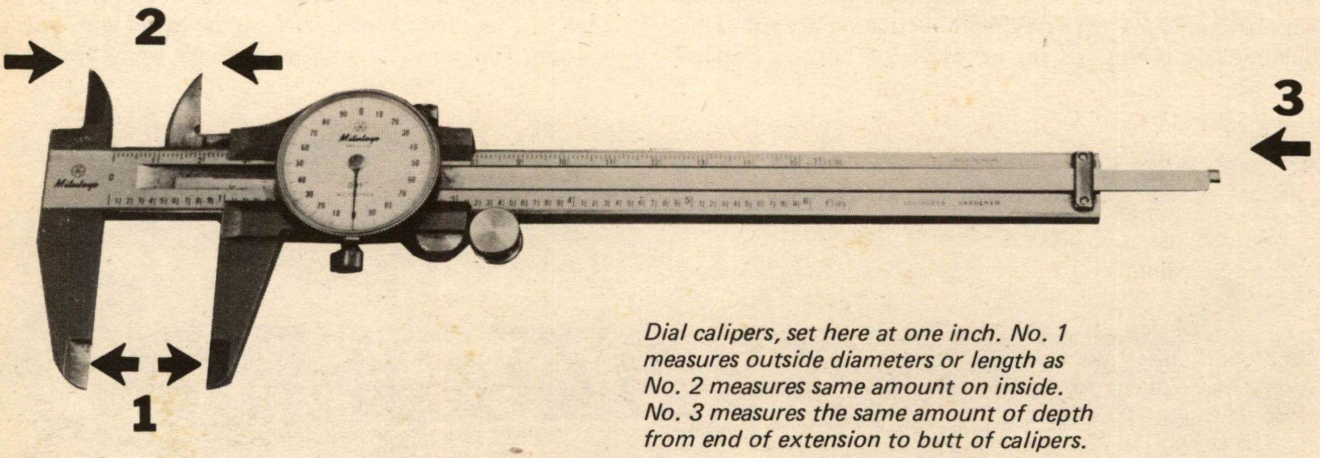
There are other jigs and fixtures on the market that will make the building of reproduction-replicas or restoration of antiques easier and, more important, help you to do a better job. Every good gunsmith has a good library, and the first step in establishing a library is to obtain a copy of every gunsmith supply house catalog.

**MEASURING INSTRUMENTS**

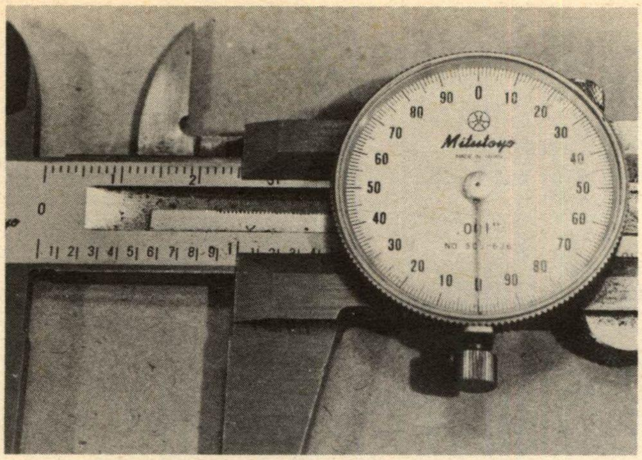
The X-ray jig is a form of measuring instrument, and you will find a need for additional measuring instruments as you progress deeper into black powder gunsmithing. Again, follow the rule of purchasing on a demand basis, and then buying the best you can afford.

The most versatile instrument, the dial caliper, combines the features of the older Vernier caliper; a one to six-inch outside micrometer, a one to six-inch inside micrometer, and a one to six-inch depth micrometer, all for the price of an average one-inch micrometer. Select the correct one and you also will have a scale that reads in both inches and metric. It is not a cure-all, a micrometer will give more precision measurements, but for ninety percent of your requirements it is fully adequate. Although all my machinist training was with micrometers, I use the dial caliper for everything but precision machining.

The arm of the dial caliper is divided into six inches. Between each inch are nine lines, the tenth line being the next inch. Each line is one-tenth inch or .10 in decimal reading. So, if we open the caliper until the slide is directly on one inch, the space between the lower inward jaws is one inch, or 1.0 in decimal reading. The upper, outward jaws would have the same reading and are used to measure the inside of a part. The sliding tip end of the calipers would also extend exactly 1.0 inch to measure depth.



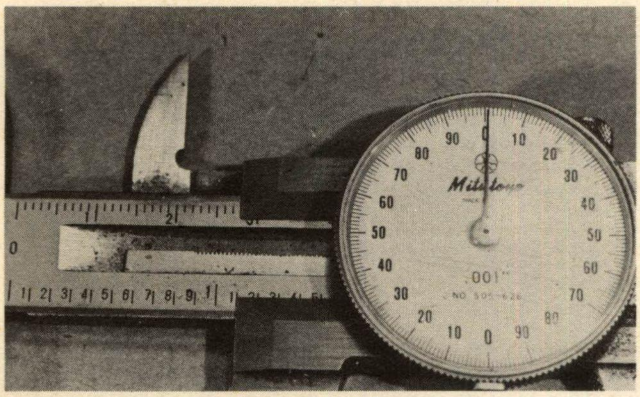

*Dial calipers, set here at one inch. No. 1 measures outside diameters or length as No. 2 measures same amount on inside. No. 3 measures the same amount of depth from end of extension to butt of calipers.*



*Bottom scale on dial caliper is in inches divided by tenths. Top scale is metric. Note sliding arm is directly on one inch.*

If we open the caliper a little more, until the first line past the one inch line is visible, our reading is one inch plus one tenth or 1.10 in decimal. If moved to the second line, it would be 1.20-inch, etc., until we reach a 2.0-inch line.

Next, note the dial on the indicator. It has lines all the way around numbered 0, 10, 20, 30, 40, 50, 60, 70, 80, 90. Going back to our first reading of 1.10-inch, the dial



*Second reading on dial caliper (dial at one-tenth). Note arm is past one-inch line and directly on first tenth division line.*

pointer should have been directly on zero. If the pointer had been on the 10 line, then our reading would have been 1.110 inches. Look closely and you will note that the space on the dial from the number 10 to number 20 is subdivided into ten smaller lines. If the dial pointer was on the first line past the number 10, then our reading would have been 1.1110 inches. Naturally, there are ten increments on the dial between zero and the number 10 on the dial, and between all other numbers, so the dial caliper can measure from .0010 inch to a full 6.0 inches and anything in-between.

The correct way to express these readings is as follows: Anything before the period is just inches. The first number past the period or decimal point is tenths. If there is a second number past the decimal point, the reading is expressed as hundredths. Three numbers past the decimal point is expressed as thousandths. A zero is usually added in written form after the last number only to show there are no more numbers.

Your dial caliper usually comes in a padded case for protection. Drop it on the floor or misuse it and odds are that you have damaged its accuracy. As a side note, some of the new dial calipers have the arm also marked in metric. Metric is based on the unit of ten and, since you are subdividing an inch by tens, the dial works with both arm scale markings.

The next measuring instrument is a good, six-inch steel machinist ruler. One edge divides each inch by sixty-fourths, the other by tenths. On the back is etched the decimal equivalent of fractions. The cost is small and you will find many uses for it in everyday shop work.

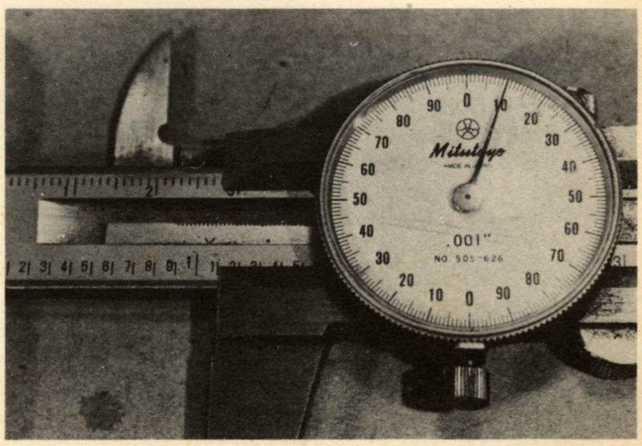
A twelve-inch carpenter's sliding combination square can be purchased at any hardware store. It is one of the most useful measuring tools you can own. If you have a good twelve-inch steel rule, the sliding arm, when locked, will give you a ninety-degree angle to square any surface, plus a forty-five-degree angle on the reverse side. On better grade models, the sliding arm also will have a built-in level and even a small, detachable scribe. The machinist's version has more useful features, but is more expensive.

A common six-foot steel tape with the ability to lock will be necessary for measuring barrel and stock lengths. During one of your trips to the hardware or paint store, pick up a couple of free, wooden yardsticks. Screw one to the side of your bench for quick measurements. The other is handy not only to measure, but also as a straight edge.

A small machinist level will find many uses and is inexpensive. You will need it for bore sighting, stockwork, metalwork, and it is an absolute necessity if you ever use a drill press for drilling and tapping.

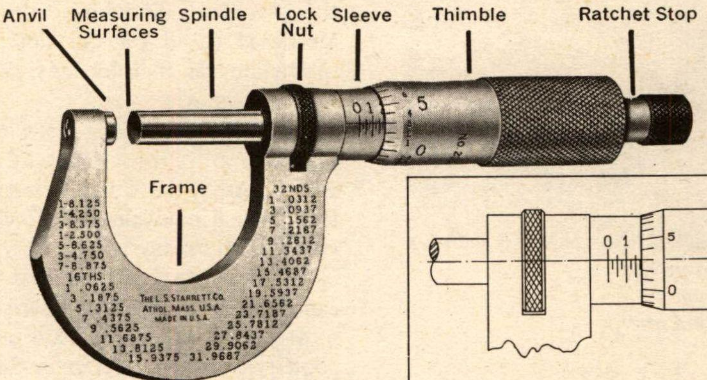
While your dial calipers will measure items about one inch wide, the jaws are not long enough to measure the thickness of a butt stock or forend section. For this you will need a six-inch toolmaker's outside caliper. A spring at the top tries to open the two arms, but a threaded rod with a hand nut prevents this. You just slip the opened arms over the section to be measured and tighten the hand nut until you feel a slight resistance. The calipers then are removed

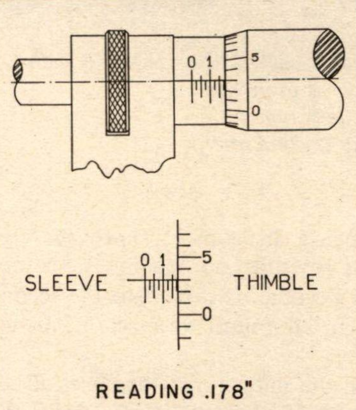
*In third reading, sliding arm is past one inch and one-tenth-inch lines. Dial is on 10, making a 1.110 decimal reading.*



**Starrett®**

## How to Read a Starrett Micrometer Graduated in Thousandths of an Inch




**Reading to .178″**

THE principle of the Micrometer consists of a highly accurate ground screw or spindle which is rotated in a fixed nut, thus opening or closing the distance between two measuring faces on the ends of anvil and spindle. A piece of work is measured by placing it between the anvil and spindle faces and rotating the spindle by means of the thimble until anvil and spindle both contact the work. The desired work dimension is then found from the micrometer reading indicated by the graduations on the sleeve and thimble as described in the following paragraphs.

Since the pitch of the screw thread on the spindle is 1/40″ or 40 threads per inch in micrometers graduated to measure in inches, one complete revolution of the thimble advances the spindle face toward or away from the anvil face precisely 1/40 or .025 inches.

The longitudinal line on the sleeve is divided into 40 equal parts by vertical lines that correspond to the number of threads on the spindle. Therefore, each vertical line designates 1/40 or .025 inches and every fourth line which is longer than the others designates hundreds of thousandths. For example: the line marked "1" represents .100″, line marked "2" represents .200″, and line marked "3" represents .300″, etc.

The beveled edge of the thimble is divided into 25 equal parts with each line representing .001″ and every line numbered consecutively. Rotating the thimble from one of these lines to the next moves the spindle longitudinally 1/25 of .025″ or .001 inches; rotating two divisions represents .002″, etc. Twenty-five divisions indicate a complete revolution, .025 or 1/40 of an inch.

To read the micrometer in thousandths, multiply the number of vertical divisions visible on the sleeve by .025″, and to this add the number of thousandths indicated by the line on the thimble which coincides with the longitudinal line on the sleeve.

Example: Refer to the illustration above:
The "1" line on sleeve is visible, representing.... .100″
There are 3 additional lines visible, each representing .025″.......... 3 x .025″=.075″
Line "3" on the thimble coincides with the longitudinal line on the sleeve, each line representing .001″............... 3 x .001″=.003″
The micrometer reading is........... .178″

An easy way to remember, is to think of the various units as if you were making change from a ten dollar bill. Count the figures on the sleeve as dollars, the vertical lines on the sleeve as quarters, and the divisions on the thimble as cents. Add up your change and put a decimal point instead of a dollar sign in front of the figures.

and the space between the two arms read by using the dial caliper inside jaws touching the arms. This is a necessary tool when you are copying an old stock or just following specified stock thickness dimensions.

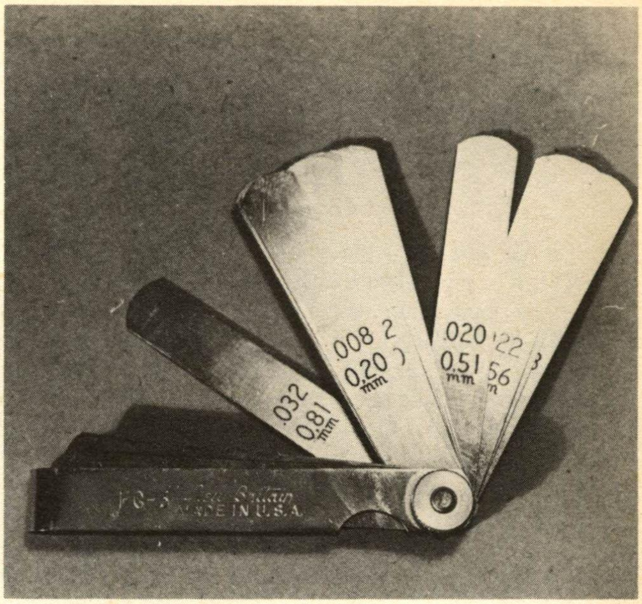
The outside caliper is only one of a three-tool set. Usually, it is cheaper to purchase the set and the other two will prove equally useful. The second tool is an inside caliper, which will reach into close places that are impossible with the dial caliper. The third tool is a divider, whose use is obvious by its name.

Need to remove the nipple from a percussion rifle? What size is it? Using your dial calipers you get a reading of .250 diameter, so you know it is a one-quarter inch, but what is the thread size? For this you need a thread-pitch gauge. This is just a series of blades with saw, toothlike notches cut in one edge of the blade. The number of teeth in one inch is marked on the blade. To use the tool you simply try various blades until the blade teeth exactly match the threads and then read the number on the blade. Suppose our sample nipple matches the number 28 blade. We then know the thread size is 28 threads per inch (TPI), so the nipple is a ¼-28 TPI size.

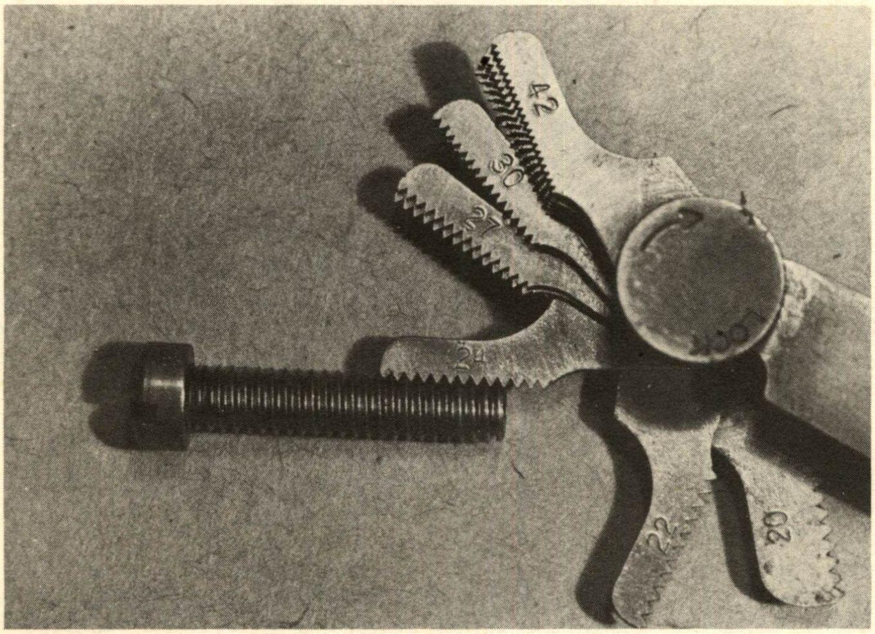
The same procedure is used to determine the size and TPI of screws. A good thread-pitch gauge will measure from

4 to 84 TPI. The American standard gauge is the most common one used; however, there are British standard and metric thread-pitch gauges available.

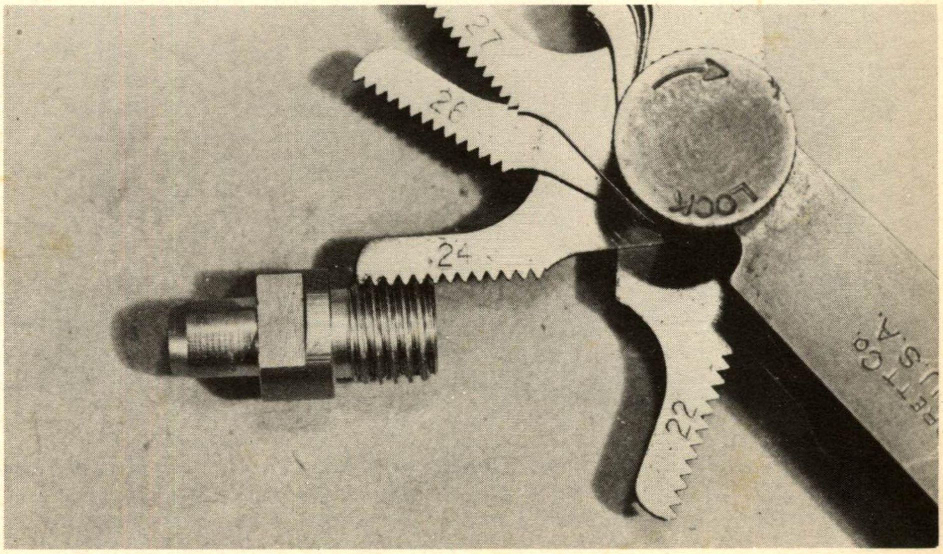
Another useful measuring tool is the thickness gauge, which has a series of fold-out leaves or blades ground to precision and with a lock screw to hold a blade in position. The best has blades ranging from .0015 to .035-inch thickness and with the metric equivalent also etched on the blade. You will need this gauge in setting space or gaps between parts. For example, the space between the front of a percussion revolver cylinder and the barrel is critical, and the only way to measure this space is with a thickness gauge. A thickness gauge at this point also will provide another piece of useful data. If the cylinder turns easily but




*Note that leaves of this thickness gauge are marked in both inches and metric with a lock nut to hold leaf firmly and securely in use.*

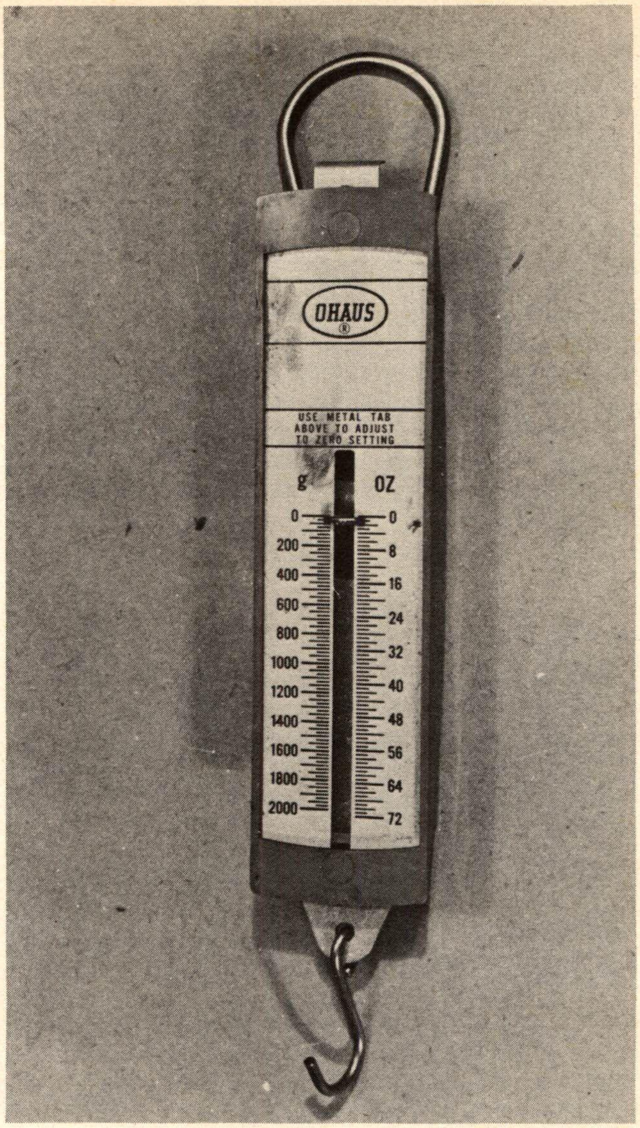



*Blades on thread gauge are used to find match of teeth to threads.*




*In this case, the thread gauge is used to measure number of threads per inch on a percussion nipple.*

*The Ohaus trigger-pull gauge is adjustable for a zero setting.*




drags on one side, then the cylinder face is not even or the cylinder pin or pin hole is damaged.

A trigger-pull gauge is a necessity in gun work. About the best is the RCBS gauge, with a scale graduated from one to seventy-two ounces, plus metric from twenty-five grams to 2000 grams. Unlike many gauges, it has an adjustment to assure absolute zero initial setting. Many gunsmiths prefer to use the old-style trigger pull weights, with extra ounces added to the weights as you progress, with extra ounces best used only to check minimum and maximum trigger pull.

Some years ago I designed a simple length-of-pull gauge. Bob Brownell added some extra features and it now is used in gunsmith shops throughout the country. It will measure a shooter's arm for length of pull required on a gunstock, the length of pull of an existing stock, amount of drop at the comb of a stock and the drop at the heel of a stock. It is simple to use and eliminates guesswork on trial-and-error methods.

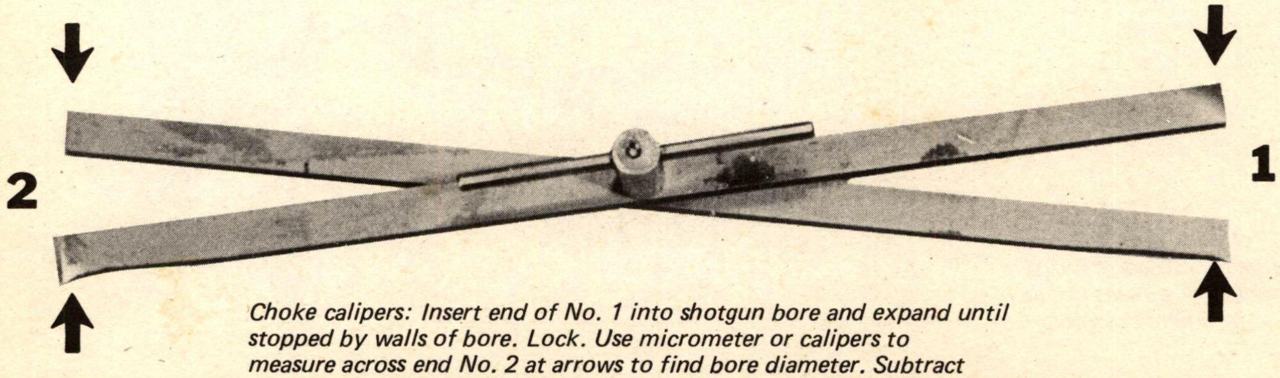
Another tool I designed for Brownell's is the choke calipers. While a dial indicator, or inside calipers, will measure the diameter of a barrel at the muzzle, neither can measure choke constriction. The choke, or barrel calipers, consists of two parallel precision ground arms with a lock screw in the exact center. One end is inserted full depth into the bore, past the choke section, expanded to maximum and locked. A micrometer or dial caliper is used to measure the other end. The lock is loosened, the calipers pulled part way back to the choke section, locked and measured. By subtracting the second choke diameter measurement from the first bore diameter measurement, you have the amount of choke constriction.

Many reproduction-replica shotguns and also a few original shotguns have choked barrels. The choke barrel calipers will provide the measurement required, and also can be used to determine how much wear there is on old, original shotgun barrel bores.

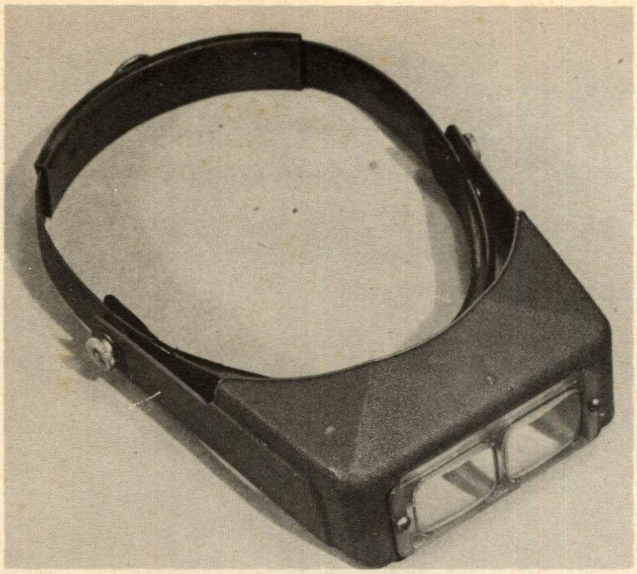
**MISCELLANEOUS**

Being able to see the work clearly gets to be a problem with age and also for those who constantly wear glasses. Even if you have perfect vision, the constant strain of looking at a work at less than a foot from your eyes will cause eye strain and often a headache.

The solution in all instances is to purchase an Opti-visor binocular magnifier. The headband adjusts in seconds and can be quickly removed. The magnifying lenses are held the correct distance from your eyes by a rugged visor that tilts




*Choke calipers: Insert end of No. 1 into shotgun bore and expand until stopped by walls of bore. Lock. Use micrometer or calipers to measure across end No. 2 at arrows to find bore diameter. Subtract choke diameter from bore diameter to find amount of choke constriction.*



*Opti-visors prevent eye strain and allow hand-free magnification. Headband and swinging lens holder are adjustable.*

up out of your way, or down for viewing, with fingertip pressure. The lenses are optical glass mounted in a plastic frame. You can purchase them in from 2 to 10X power, but the most useful is the 3X; for real close work, the 5X power. Once you use the visor, you will seldom be without it.

A similar and inexpensive tool is a small, folding, pocket magnifier with two 5X power lenses that give you 5X with one lens or 10X with both lenses. Hairline cracks, not visible with the naked eye, are seen easily under close inspection with one or both lenses. This is extremely important when restoring antiques. It also is handy for looking at old proof marks, or when the name on a lock plate or barrel is badly worn.

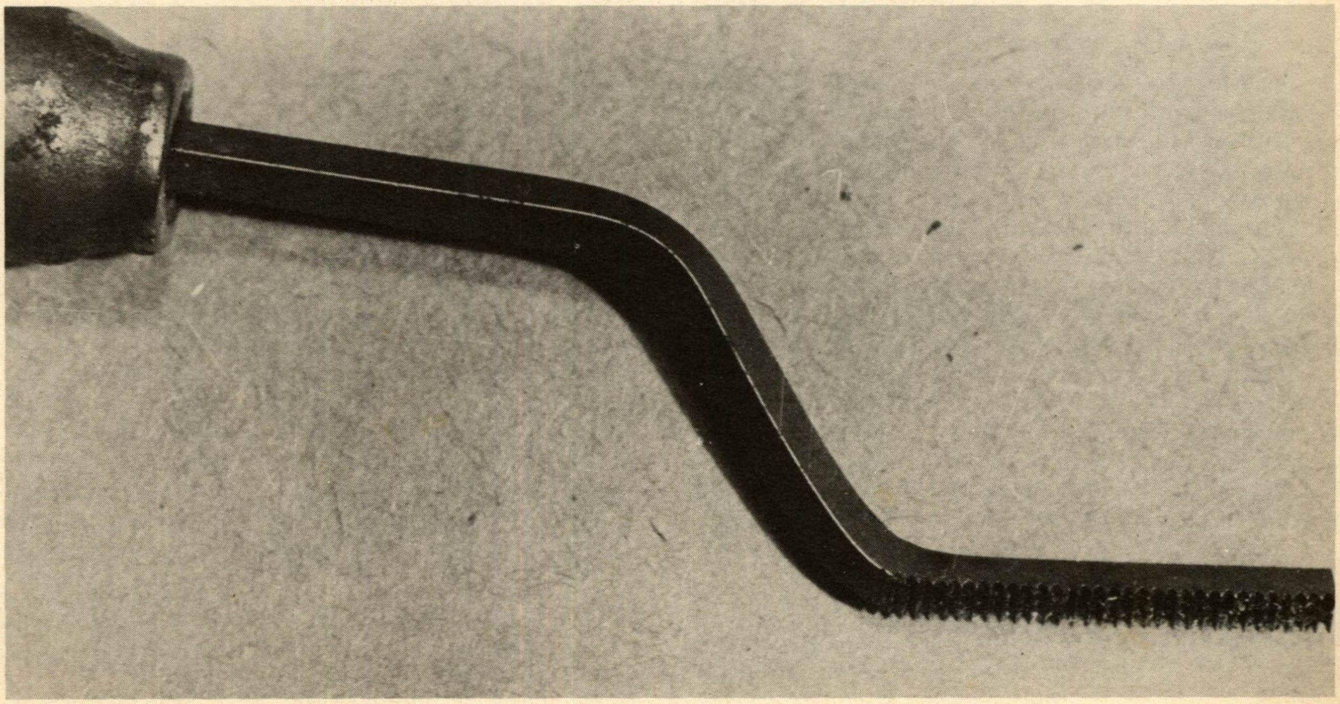
While on the subject of proof marks and names on a gun, a set of steel letter and number stamps is a desirable shop item. If you build a reproduction-replica kit, it is only natural to want to stamp your name and perhaps a date on the gun. The sets are usually Gothic style, cut into the end of a one-quarter-inch square tool-steel bar hardened for long life. Letter size is one-sixteenth, 3/32, one-eighth and the large 3/32 inch. The one-sixteenth and 3/32 inch sizes are the most common choices.

Learning to use the stamps to maintain a straight line and evenly space letters and numbers requires practice. Draw a straight line with a sharp pencil on the work to be stamped. Hold the stamp in your left hand, line it up with your mark and rap the back of the stamp with a four-ounce steel hammer. The trick is to stamp backwards, last letter first, as this allows you to tilt the next stamp slightly to line it up before holding it straight for the hammer blow. If you are left handed, hold the stamp in your right hand and stamp first letter first. In other words, if you are right handed, stamp right to left; if left handed, stamp left to right.

If you want to avoid the problem and turn out stamping equal to someone with about ten years' experience, B-Square makes a simple stamp guide that will fit round or octagonal barrels, or any flat surface. It will accept twenty of the one-sixteenths-inch stamps or thirteen 3/32-inch stamps. You simply stamp the first letter or number, remove the stamp, drop in a spacer, insert another stamp, tap it with the hammer, remove the stamp, drop in another spacer, etc., until you have completed the stamping.

There is seldom any checkering on muzzleloaders except

*Kennedy jointer single-cut checkering tool is longer than most and good for cleaning up old checkering grooves.*




*Jerrow's inletting black, left; Prussian blue, right. Inletting black is for wood; Prussian blue for metal.*

for some flat-type checkering on double-barrel percussion shotguns and perhaps some of the transition guns. Most work will consist of cleaning old checkering or recutting some worn spots in restoration. For this you will need a stiff toothbrush to clean out the accumulated dirt, grease and grime. The only checkering tool you will need is the single-line cutter. There are several good brands to choose from. Dembart makes a good tool, but the best one to use is the Kennedy jointer. It is an extra-long single cutter that helps keep the lines straight. A good book to own is *Checkering and Carving of Gunstocks* by Monty Kennedy. The carving section contains a wealth of information that can be applied to black powder guns.

Inletting metal parts into the gunstock will require some substance that can be applied to the metal to prevent the part from entering the wood, so that the metal high spots will leave some type of mark on the wood. The old, standard method was to use black soot from candle smoke. The metal part must be free of oil and held about an inch above the candle flame until it is dark from the soot. When placed in or against the gunstock wood, the soot on the metal high spot is transferred to the wood at the correct spot. This portion of wood is lightly cut away, the metal part re-smoked and the process repeated until there is a perfect wood-to-metal fit.

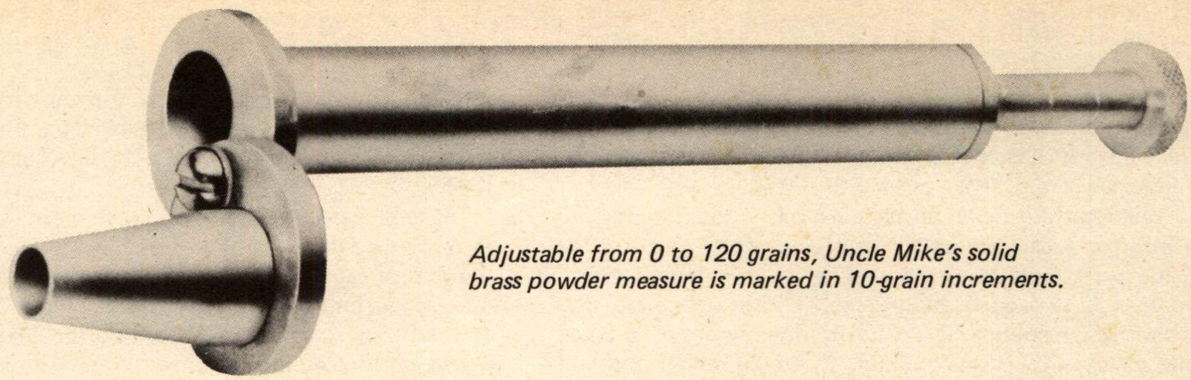
The major fault with candle-smoke soot is that the metal spots that are not high continue to receive a layer of soot every time until the built-up layers give a false imprint on the wood. A far superior system is to purchase a small bottle of inletting black from a gunsmith supply house. With the metal free of oil, use a small artist brush to dip into the solution and apply a thin coat over the metal part. It leaves a much cleaner mark on the wood. The main advantage, however, is that you use the artist brush to

redistribute the initial thin coating for the next marking. There is no layer build-up and a three-ounce size bottle will inlet dozens of stocks. It washes off easily when you are finished.

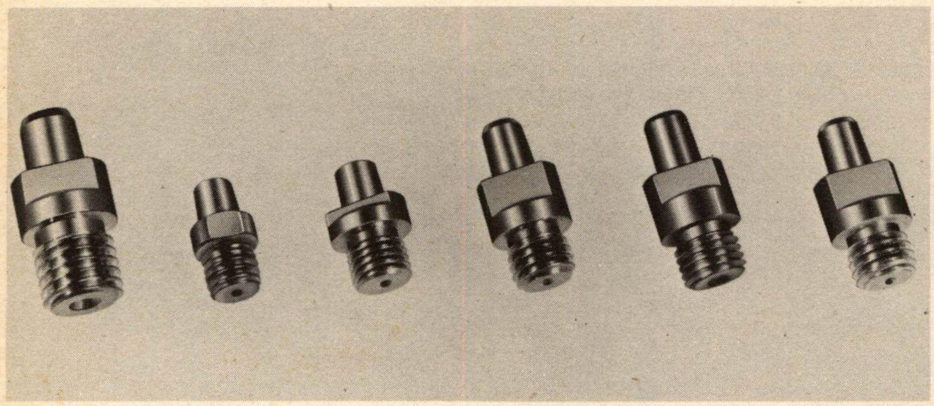
Prussian blue is a purple-blue paste that is used to achieve a precision metal-to-metal contact. One of the metal parts receives a thin coating with an artist's brush. When the two parts are assembled, the high spots that would cause binding or excess friction are clearly marked and removed by filing or stoning. It should not be confused with artist oil paints, where Prussian blue is a color. Also, do not use it as a substitute for inletting black on wood working. It is easily removed from metal with alcohol, but almost impossible to remove from wood. Purchase a tube from a gunsmith supply house to be sure you have the right type.

Dykem layout fluid also will prove useful when you have to make a part such as a flat spring. A brush comes with the four-ounce can to spread the fluid over the metal surface. It dries in two minutes, leaving a coat only .0002 inches thick. The old part, or a pattern, is laid on the coated metal and traced with a sharply pointed scribe. The scribed line is easily seen against the coated surface, allowing you to cut and file the part to almost zero tolerance. The dried fluid

*B-Square's Companion Vise Jaws for octagonal barrels are constructed of nonmarring aluminum and will hold any size barrel without damage. The jaws securely clamp the barrel and will hold it secure when unscrewing breech plugs or adjusting sights.*



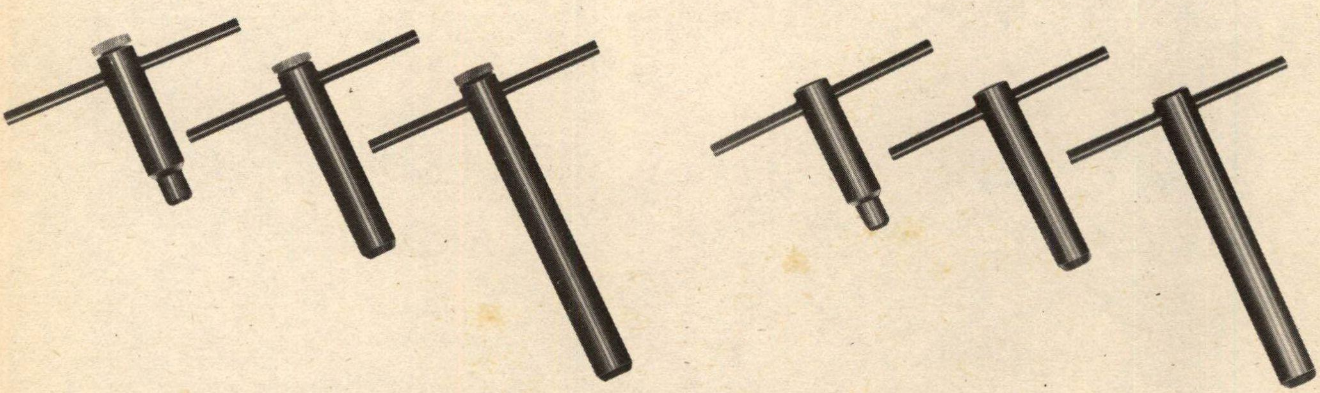
*Adjustable from 0 to 120 grains, Uncle Mike's solid brass powder measure is marked in 10-grain increments.*



*Uncle Mike's six styles of rifle, pistol and musket nipples, all in heat-treated stainless steel.*

will not rub off like a pencil mark, yet when the work is finished an alcohol-soaked cotton swab will remove all traces of the fluid.

While on the subject of making replacement parts, a broken flat spring is a common source of malfunctions. Trying to make a replacement spring from scrap springs usually results in failure. Sometimes you can get lucky and find an exact replacement or one that requires only minor modification. Check the various gunsmith supply houses first. If you aren't successful, you will have to make a replacement from flat spring stock. It comes in two sizes, small-thin and heavy-thick. Twelve pieces, eighteen inches long, are packed in each kit. With these two flat-spring stock kits you can make any spring. What is more important, the steel composition is consistent, which eliminates guesswork. The actual making of replacement flat springs will be discussed in another chapter.



*Uncle Mike's nipple wrenches for rifles, pistols and muskets are available in plain style and in deluxe style with a removable aperture pick.*

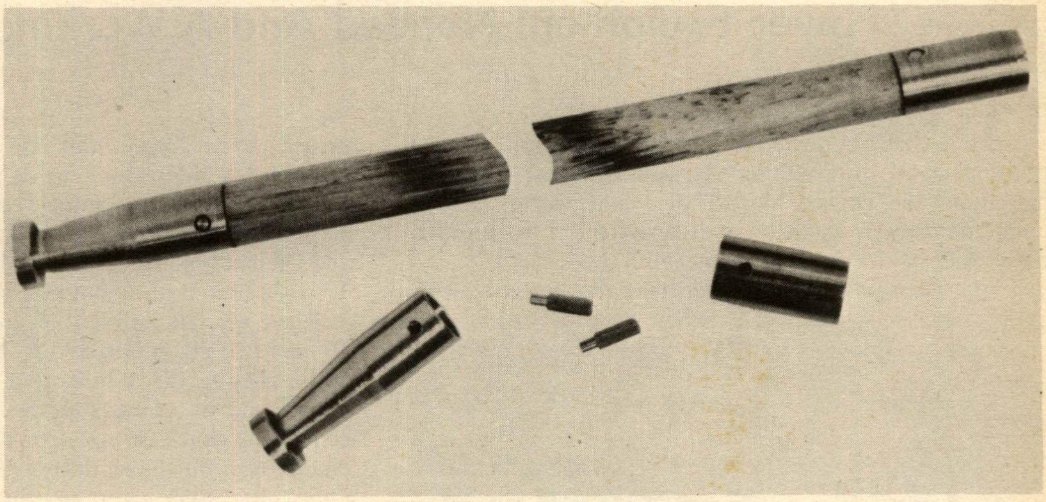
Other tool steel can be purchased from either a gunsmith supply house or a machine tool supply house. Scrap steel can be used to make gun parts, but it is best to know the type, hardness procedure, etc., for best results. After several years' experience, you can come close to guessing the quality of the steel. Until then, the best rule-of-thumb is to know what the scrap steel was originally used for and compare this with your needs.

A high sheen on brass can be achieved several ways. The best brass polish, which contains a small amount of ultra fine abrasive, is Simichrome. It comes in a two-ounce tube and is available from gunsmith supply houses. It is the best for removing tarnish and oxidation, not only from brass but just about any other metal. With light pressure it will only clean and polish; with heavy pressure and rapid strokes it will polish deeply as well as clean.

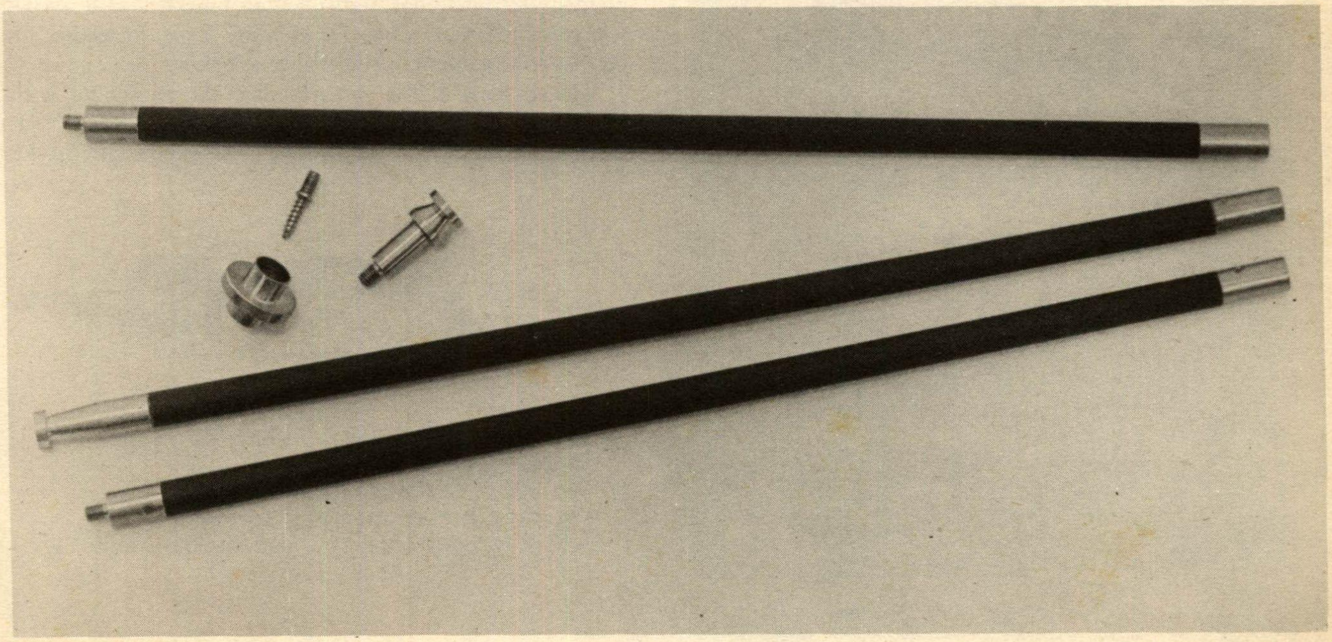
Part of black powder gunsmithing is obtaining the right powder charge for maximum performance. The spout and flask-type chargers leave a little to be desired in accuracy. An adjustable powder charger, such as the one produced by Michaels, will go from zero up to 120 grains, and allows different charges to be tested. You can then make a charger to hold the same amount of powder for use with a powder horn. Several companies, such as Dixie Gun Works, supply long charger tubes that are cut to desired length and fitted to a powder flask. An even better tool is a standard reloading scale that registers from zero to 500 grains.

Shop accessories are virtually unlimited. Some you will have to buy, others are found in most homes and still others can be had for no cost. For example, I have never been in a gun shop, regardless of whether it is a small hobby shop or a big commercial shop, without seeing cigar boxes. They seem to be universal accessories. With the lid removed they are ideal on the bench to hold parts and prevent them from being lost when working on a gun. If you are building a gun, they are perfect to hold parts until needed and, last but not least, they make ideal parts cabinets.

The better organized your work area with tools and accessories, the more pleasure you will receive working on black powder guns. Go slow, and it is only a matter of time before you accumulate a fully equipped work area or shop.



*Michael's three-piece easy-carry ramrods are made of fiberglass with brass joints. They have worm and cleaning jags and a brass muzzle guard. For .45, .50, .54, and .58.*



## CHAPTER 4

# POWER TOOLS AND A PLACE TO WORK

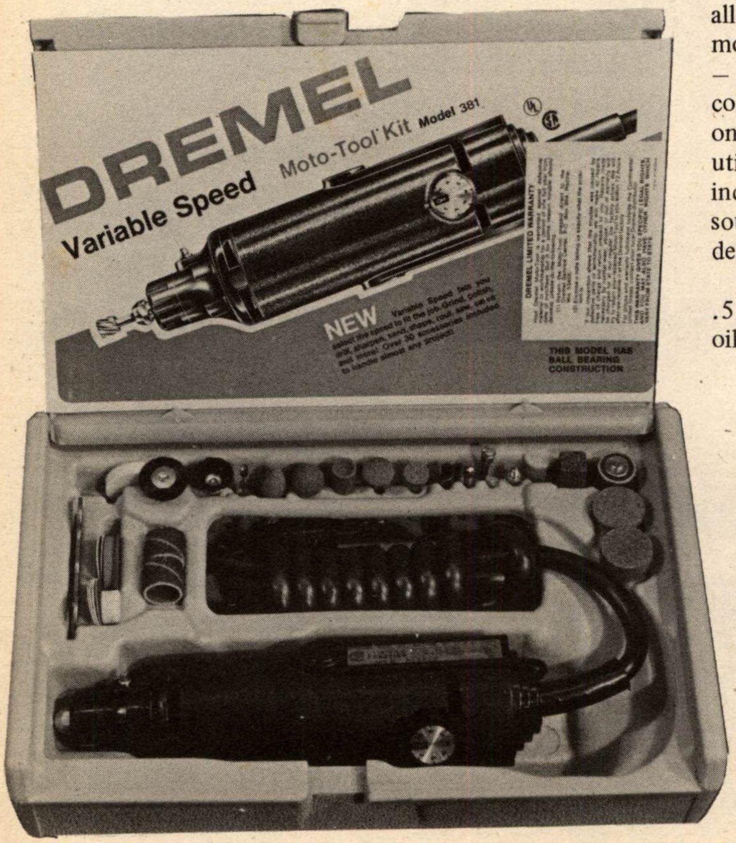
### Specific Recommendations On Power Equipment Needed And A Working Area

IF I COULD own only one power tool for full-time professional gunsmithing I would choose, without hesitation, the Dremel Moto-Tool and its accessories. It unquestionably is the most useful and the most versatile power tool to be found in any gunsmith shop.

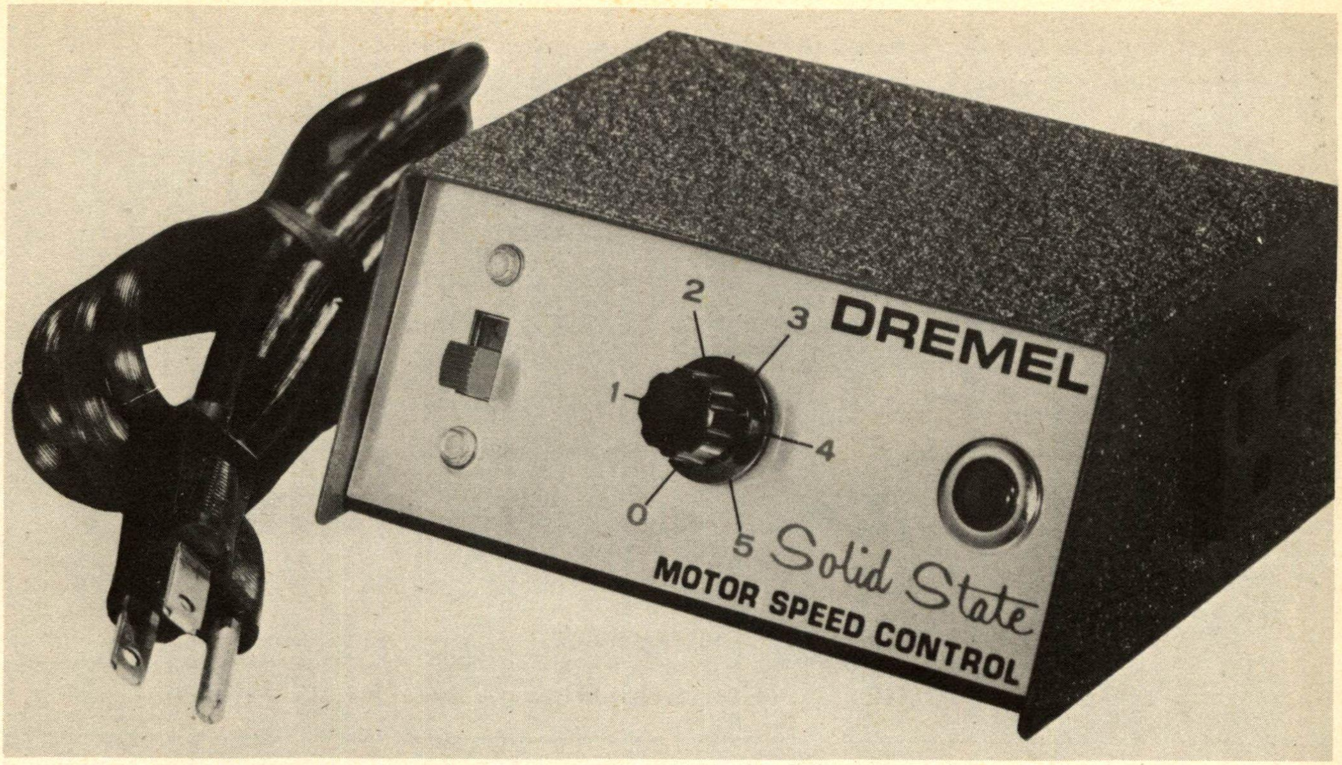
Forty years experience of constant tool improvement, rugged dependability, plus fast and reliable factory service are some of the reasons for its popularity with gunsmiths. Add to this a low initial cost investment, thirty-four accessories in a self-contained kit no larger than a cigar box, and Dremel's motto of being a multipurpose workshop with 1001 uses is not just a hot air advertisement!

There are five different Moto-Tools to choose from, but all have two things in common. First is a permanent magnet motor that greatly reduces tool size without loss of power – in fact, it increases power. Second, they all accept collet-type chucks in sizes one-eighth, three-thirty-seconds, one-sixteenth and one-thirty-second inch, allowing you to utilize tool bits with any of these shank sizes. This, incidentally, includes used dental burrs, a free tool-bit source of many uses usually obtainable just by asking your dentist to toss them in a box and save them for you.

The smallest of the Moto-Tools is the Model 260 with a .5 amp, 115 volt, 60-cycle AC-DC motor. It has oil-impregnated bearings and delivers a constant no-load




*The Dremel Moto-Tool is the handiest, most versatile tool available to the gunsmith; beginner or professional. Dremel may be purchased with accessories in kit form, left, or without, above. Variable speed model shown.*




*The variable-speed table-top adaptor may be added to the Dremel Model 260 without built-in variable adjustment.*

speed of 30,000 revolutions per minute. It is primarily designed for light duty application.

Next is the larger and more powerful Model 270 with an .8 amp motor, oil-impregnated bearings and the same constant no-load 30,000 rpm speed. Third is the Model 280 heavy-duty industrial type with ball bearings. It has a .9 amp motor with a constant no-load 30,000 rpm speed.

The Models 270 and 280 now have a useful feature in the form of a small dial that is both the on-off switch and a built-in variable speed control. This gives a no-load range from 5000 to 25,000 rpm. Previously it was necessary to plug the Dremel tool into either a foot or table-top variable speed accessory. The accessory is still available for the Model 260.

*Dremel also offers a foot-operated variable speed control which frees both hands on the workbench.*


I had always used the Model 280 with a table-top variable speed adaptor, but it only required a few minutes with the fingertip dial-a-speed to convince me of the assets of the extra convenience speed control. The smaller of the two versions is the Model 370, drawing .8 amps and with oil-impregnated bronze bearings. The industrial duty Model 380 draws .9 amps and has ball bearings.

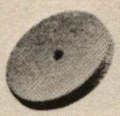
If you add the number one after the designated Moto-Tool model number, such as Model 381, then you have both the tool and the accessory kit which includes a molded polyethylene carrying and storage case. The investment is only about $10 extra, and the thirty-four accessories in the kit are a bargain compared to the cost if priced individually. Included are high-speed cutters, emery and silicon grinding wheels and points, sanding discs and sanding drums, polishing points and wheels, just to name a few items. All are useful in gunsmithing requirements. Replacements, special shaped, and special purpose accessories are available singularly or in packs.

In gunsmithing, it is difficult to say which of the accessories are the most useful, but based on necessary replacements due to use I would have to list the various grinding stones as number one. The aluminum oxide mounted wheels and points are available in over two dozen different shapes. With them you can grind and shape just about any type of metal to any shape. A small item that comes with the initial kit is the dressing stone. This is held in one hand, or on the bench, while the grinding wheel is pressed against it with the motor running. Its purpose is to shape or reshape the grinding wheel or point. The plain, wheel grinding bits are useful for common work and are

*Accessories for the Dremel Moto-Tool are available to the blackpowder gunsmith in almost unlimited variety.*

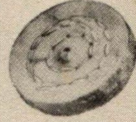
## Polishing Accessories

**Polishing Point No. 427** impregnated with emery for polishing metals. 1/4" dia. by 7/8" long. Fits Mandrel No. 424. Shape with Dressing Stone No. 415.



**Polishing Wheel No. 425** Impregnated with fine emery and is ideal for polishing metals. 7/8" dia., 1/8" thick. Use with Mandrel No. 402.

**Polishing Compound—No. 421** Apply to buffing wheels. You'll find it ideal for bringing a high luster to metals or plastics.



**Cloth Polishing Wheel—No. 423** 1" dia. For polishing all metals and plastics. Use Polishing Compound No. 421. Fits Mandrel No. 402.

**Felt Polishing Tip—No. 422** 3/8" dia. ideal for polishing in corners and hard-to-get-at places. Fits Mandrel No. 401.

**Felt Polishing Wheels** 1/2" dia. No. 414 fits Mandrel No. 401. 1" dia. No. 429 fits Mandrel No 401. It's ideal for polishing large areas.

## Sanding Accessories

**DRUM SANDER—No. 407**

Ideal for rough shaping wood and smoothing fiber glass. Sander bands are replaceable and available in 1/2" size. Comes with one band. 1/8" shank.

**Drum Sander Bands**

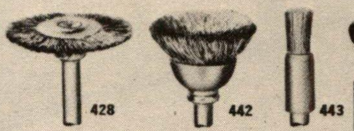
1/2" dia. coarse grit—No. 408
1/2" dia. fine grit—No. 432

**SANDING DISCS**

No. 411—36 sanding discs, coarse, 3/4" dia.
No. 412—36 sanding discs, medium, 3/4" dia.
No. 413—36 sanding discs, fine, 3/4" dia.

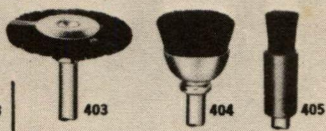
## Brush Accessories

DO NOT RUN CATALOG NO. 428 IN EXCESS OF 15,000 RPM




**WIRE BRUSHES**

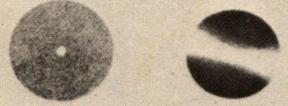
Small, versatile steel brushes for efficiently removing rust and corrosion, polishing metal surfaces. 1/8" shanks.




**BRISTLE BRUSHES**

For cleaning and polishing silverware, jewelry and metal surfaces. Ideal for hard to reach places. 1/8" shanks.

## Cutting Accessories



**CUTTING WHEEL No. 409**

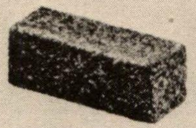
A handy emery wheel for slicing, cutting-off and similar operations. 36 discs per package.

**STEEL SAW**

Provides exceptionally clean cuts in soft materials or fiber glass. Fits on Mandrel No. 402. Comes in two thicknesses:

.005" thick—No. 406
.020" thick—No. 400

## Miscellaneous Accessories



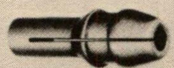
**DRESSING STONE No. 415**

Dressed Emery Wheel Points cut faster and smoother. Size 3/8" square by 1" long.

**ADAPTER SLEEVE—No. 55090**

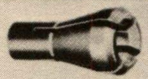
Required for No. 260 Moto-Tool when it is used with the No. 223 Universal Stand, and the No. 210 Drill Press.

**CHUCK COLLETS**



For Moto-Tools Nos. 1, 2 & 3 and flexible shaft.

No. 416—1/8"
No. 417—3/32"
No. 418—1/16"
No. 419—1/32"

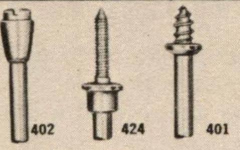


For Moto-Tools Nos. 260, 270 & 280

No. 434—1/8"
No. 435—3/32"
No. 436—1/16"
No. 437—1/32"

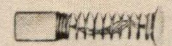
For Moto-Tools Nos. 245, 250, 260 Series 55-, and 55-4, 270 Series 66-2, 280 Series 66-2, Nos 370, 380 and Moto-Flex Tool No. 232

No. 480—1/8" No. 482—1/16"
No. 481—3/32" No. 483—1/32"



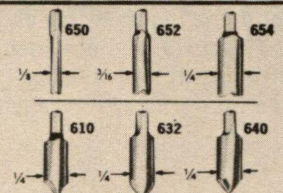

**MANDRELS—1/8" Shank**

401—Screw Mandrel is used with polishing accessories.
402—Mandrel to be used with all cutting wheels, sanding discs and polishing wheels.
424—Screw Mandrel to be used with No. 427 polishing wheel.



**MOTOR BRUSHES**

No. 30529 — For Moto-Tools No. 2 & 3
No. 32 — For Moto-Tool No. 1
No. 990814 — For Moto-Tools Nos. 270, 280, 370, & 380
No. 990804 — For Moto-Tool No. 260
No. 990846 — For Moto-Tool No. 245, 250 and Moto-Flex Tool No. 232




**HIGH SPEED STEEL ROUTER BITS**

For routing, inlaying, mortising in wood and other soft materials. 1/8" shank. Use with Dremel router attachment. No. 229 shown on page 3.

**SAFETY GOGGLES No. 1228**

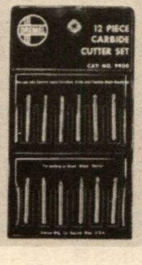
Protect your eyes when grinding or carving. Industrial quality for maximum protection.

**12-Piece Silicon Grinding Point Set No. 205**


Consists of 12 high quality silicon grinding points packed in vinyl fold-up pouch.

| | |
|---|---|
| 83142 | 84922 |
| 83642 | 83322 |
| 85422 | 83702 |
| 85602 | 84642 |
| 85622 | 85342 |
| 84382 | 85562 |

**12-Piece Tungsten Carbide Cutter Set No. 9900**




Consists of 12 of the most useful shapes and sizes needed for industrial and general use packed in a vinyl fold-up pouch.

| | | |
|---|---|---|
| 9901 | 9905 | 9909 |
| 9902 | 9906 | 9910 |
| 9903 | 9907 | 9911 |
| 9904 | 9908 | 9912 |

**6-Piece Router Bit Set No. 600**

Packed in vinyl, fold-up storage pouch. For precision routing inlaying and mortising. With 1/8" shank.


650 (1/8")
610 (1/4")
652 (3/16")
632 (1/4")
654 (1/4")
640 (1/4")

**34-Piece Accessory Set No. 990349**

A practical set for the all around craftsman. With the Moto-Tool accessories in this set you can grind, polish, saw, sand, deburr . . . the set contains:

| | |
|---|---|
| 3-Bristle Brushes | 3-Cutoff Wheels |
| 1-Collet (3/32") | 1-Dressing Stone |
| 1-Drum Sander | 2-Mandrel |
| 3-Polishing Wheels | 1-H.S. Steel Cutter |
| 1-Twist Drill | 7-Mounted Wheel Points |
| 3-Coarse Sander Bands | |
| 1-Chuck Wrench | 7-Sanding Discs |

available in diameters from one-eighth to one inch. The silicon grinding points are primarily for marking on hard steel, not for grinding.

The uses to which the various grinding wheels and points can be applied are limited only by imagination and experience. You can shape a rough casting to almost a finished surface using only grinding wheels and points in a Dremel Moto-Tool. Like any other quality tool, the finished product depends only on the skill of the operator. The more you use it, the more your skill will develop.

High-speed cutters are, in reality, small milling cutters. Again, there are about two dozen sizes and shapes. They will cut all but the hardest of tool steels, although a common mistake is to try to make them cut too much at one pass. If used in somewhat of a shaving-type cut, they will perform correctly. Incidentally, even with large milling cutters in a milling machine, the depth and rate of cut is regulated to prevent damage to the milling cutter.

For really tough steel, use the tungsten carbide cutters. There are twelve shapes and they are not cheap, but with one securely locked in the Moto-Tool collet you can really remove metal! Tungsten carbide is about the toughest cutting tool available, but its extreme hardness makes it easy to break if abusive pressure is used. Properly used, tungsten carbide cutters will outlast regular carbon cutters many times over, especially on high-speed tool steel.

Polishing points and wheels are impregnated with emery and mounted independently on reusable one-eighth-inch shank mandrels. Their primary purpose begins when you have finished shaping with the cutters and grinders. They will cut the hardest of metal, bringing it up to a high gloss. I use them so much that I usually buy them in a dozen pack.

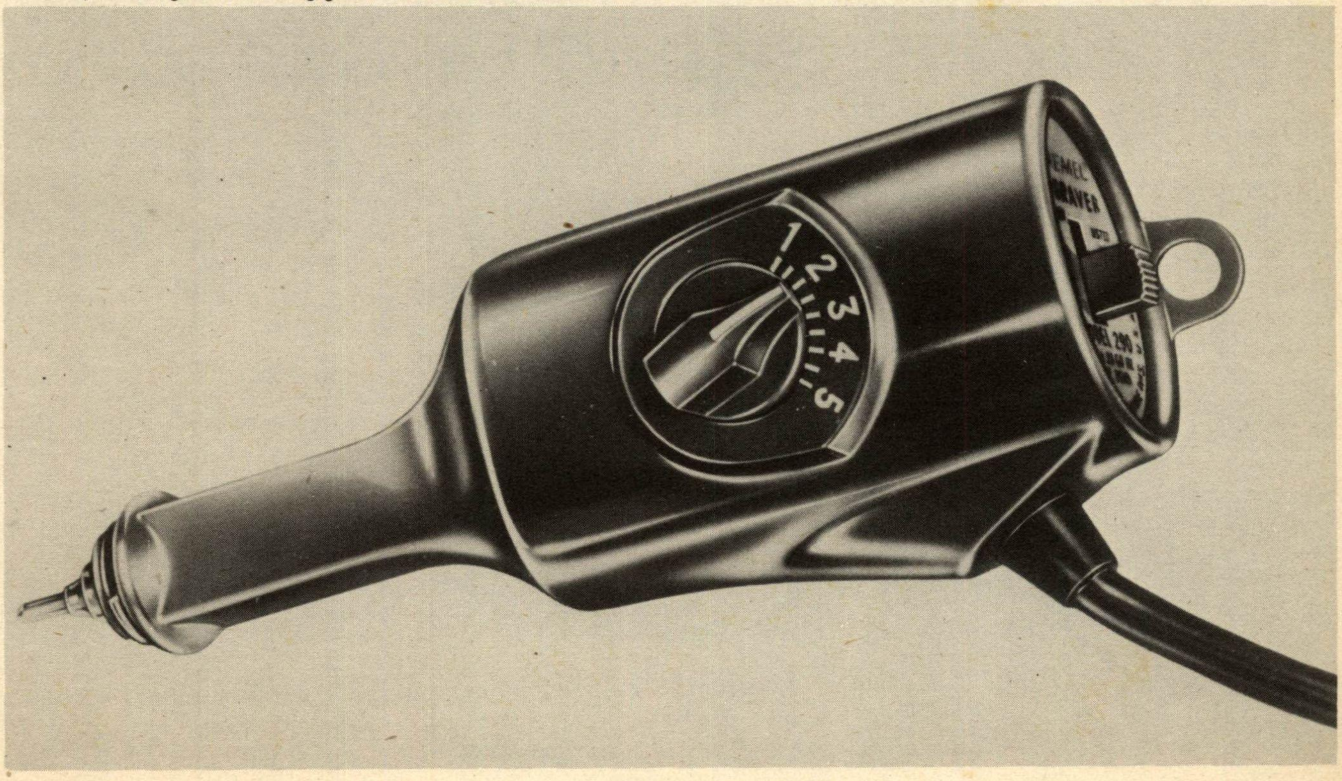
The cloth and felt polishing wheels and points also mount on reusable mandrels. They can be used without any compound, or you can use regular polishing compound to charge and recharge the surfaces. In essence, they are small, hand-held buffing wheels.

Brush accessories are available in wire or bristle, three basic shapes of each. Their main use in gun work is to clean out rust and other residue in tight spots when you do not wish to polish the metal. They are not used as often as some other accessories, but when the need arises they are just the ticket.

The final metal accessory, and one of the most useful, is the emery cutting wheel. Normally, only one is mounted on the reusable 402 mandrel, but you can mount two at one time. To give you an idea of how useful they are, I buy them in the thirty-six disc pack. They will slice through a gun barrel, if you hold it steadily and apply constant pressure. You can cut pins, screws, springs and any other metal. It will only require a short time using these emery cutting wheels before you will find literally hundreds of applications in gunsmithing.

The Dremel Moto-Tool is equally useful for woodwork.

*Electric engraver from Dremel may be used to mark ownership of any personal items and use is not necessarily restricted to blackpowder guns. Marking gunsmith and homeowner tools with name or number is positive indicator of ownership.*



The drum sander expands to hold replaceable sander bands by turning the front screw. The bands are available in fine, medium and coarse grit. Properly used, the drum sander will solve many close, hard-to-reach stock shape finishing problems. Sanding discs are also available, but I have found them of limited use in stockwork.

One of the most useful of the accessory bits are the high-speed wood router bits, available in six shapes. Their primary use is in inletting a stock for components and accessories. Router attachment 229 holds the Moto-Tool and provides calibrated depth control of the router bits. It can be used free-handed or for bench-type surface routing.

The drill press stand attachment holds the motor tool vertical, similar to a drill press. Naturally, due to its size, it cannot duplicate a drill press, but it has a twenty-inch high, three-inch throat capacity, and the 4x4-inch table can be precision adjusted in height for routing and shaping plus one-inch table travel. The universal stand accessory attached to the bench simply holds the Moto-Tool stationary. It allows tool adjustment at any angle, and frees both hands to guide the work as the tool rotates the selected bit.

Why has so much space been devoted to the Dremel Moto-Tool? A lot of black powder gunsmithing consists of hobbyist building gun kits in a limited work space. The Dremel tool allows him to do work that otherwise would require large power equipment. Low-cost investment is only another small, but important factor, although the main reason is simply that it is the most useful and versatile hand power tool in gunsmithing.

An electric hand drill is probably the next most useful power tool. Where the Moto-Tool stops, the electric hand drill begins and can be used in many similar capacities with the various available attachments and accessories.

They come in three basic chuck sizes: one-quarter inch, three-eighths inch and one-half inch. The one-quarter inch is the most common, but for gun work it is just a bit too small, which limits its usefulness. The one-half inch is just too big, unless you are building and repairing full-size muzzleloading cannons.

From the school of hard knocks and lighter wallet, I have found the most useful and versatile to be the three-eighths inch, medium or industrial grade with variable speed and a reversible switch. This is one time that the usual kit should not be purchased. Apply the extra dollars saved toward a quality drill. The little accessories that

*The Rockwell ultra-high-speed 12,000 cycles-per-second orbital sander must be properly used for best results. Basic instructions require user to rely upon weight of sander only and apply no added pressure to work.*

supposedly allow you to power tap a hole are useless in gun work. The only useful accessory is the small stand that will hold the drill stationary on a bench. It simply frees both your hands and you can use the drill with a grindstone and similar accessories.

Stands designed to hold your hand drill and turn it into a drill press look like just the ticket. Forget them! They are about as steady as a one-legged drunk mule. You can do much more accurate drilling by hand. The best way is with the help of a friend. You keep the drill lined up north and south by eye, while your friend gives east and west directions. A sharp drill, secured work and slow, steady pressure is the key to accurate power hand drilling.

While the electric power drill, even the best grade variable speed, will do most of your work, I would still advise buying a small, hand-powered, egg-beater-type drill. The cost is small and there are many instances where the feel of the drill cutting makes a lot of difference in delicate work. It has a variety of uses and was the standard hand drill for gunsmiths before the power hand drill.

Black powder guns normally have a lot of wood to be sanded, especially the full-stock rifles and muskets. There is absolutely nothing to prevent you from doing the complete job with sandpaper, small backing blocks and a lot of elbow grease.

To a professional gunsmith, however, time is money. For years I tried just about every power sander on the market in an effort to find some way to cut down on the time required to properly sand a stock. Invariably, they left gouges, dished-out sections and those inevitable cross-grain scratches.

Rockwell makes an ultra-high-speed orbital sander that orbits the pad at 12,000 cycles per minute. This, plus the full ball-bearing construction and direct motor to pad connection, creates a combination vibration/high-speed orbiting motion that eliminates the problems encountered with other power sanders in gunstock work. An added feature is that a regular sheet of sandpaper is divided and cut to make four sanding pads.

The pad has two flat sides for close work, plus rounded ends where the spring-loaded clips hold the sandpaper to the pad that are useful where a sharp edge is not desired. The tool is shaped to be held in your closed fist rather than with a handle, which results in better control.

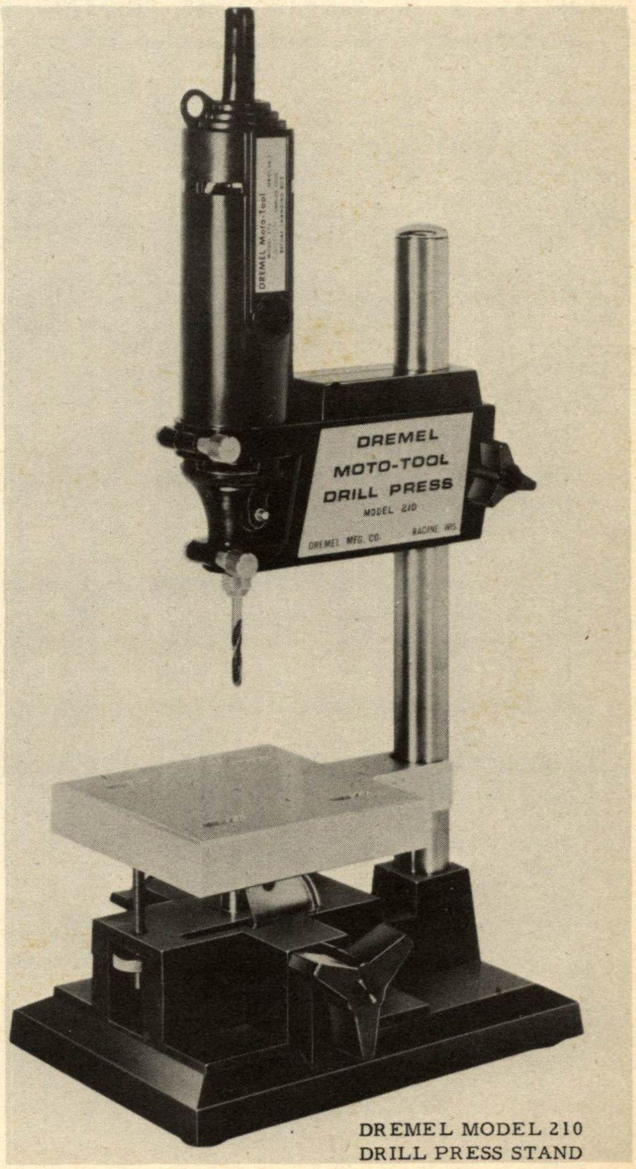
There is, or can be, one major problem in using the tool. Failure to read and follow the operating instructions that come with the tool. The heart of the instructions is not to exert any pressure. It is specifically designed to be held slightly loose and let only the weight of the tool supply the pressure on the pad. The tool is so efficient that its weight will actually sand its way through a one-inch-thick pine board.

Properly used you can sand a rough-rasped stock down to the ready for the finishing stage in less than an hour – even faster with practice. Naturally, as the sanding progresses, you use an ever-increasing finer grit sandpaper.

These power tools will last for years if used correclty and maintained as outlined in the instruction booklets. These and your hand and shop tools will take little space, yet allow top-quality construction of reproduction/replica kits. They also will be completely sufficient for most restoration work. In combination with your hand tools they are the solid foundation of all gunsmithing.

Additional power tools are more expensive and require a larger work area. If the work area is available, however, then follow the same basic rule of adding only on a demand basis. The least expensive and most useful is a power head. This is a metal stand with a one-half-inch diameter mandrel passing through the head. A pulley in the center transmits power from an electric motor via a belt. Each end of the mandrel is threaded and equipped with a lock nut. You can attach wire brush wheels, felt and loose muslin polishing wheels, and even grindstones simply by changing the wheels. Use a one-quarter horse power 1725 rpm motor and the pulleys on a one-to-one basis. Your local machine supply or hardware dealer can assist you in making the selection.

The second most useful power tool is a bench drill press.

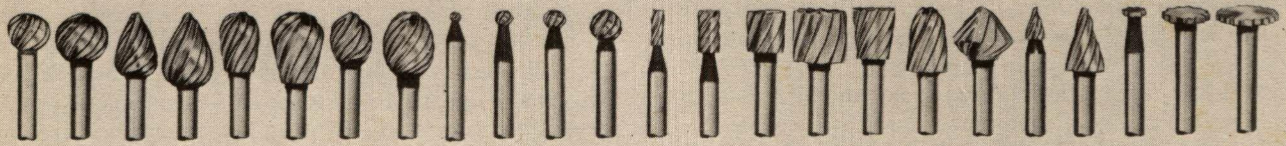



*The drill press stand for the Dremel tool is an accessory that can add considerable versatility to the gunsmith's capabilities. Table is 4x4" and features precision one-inch travel adjustment.*

*Accessories, tips and cutters for Dremel power tools number literally into the hundreds of selections.*

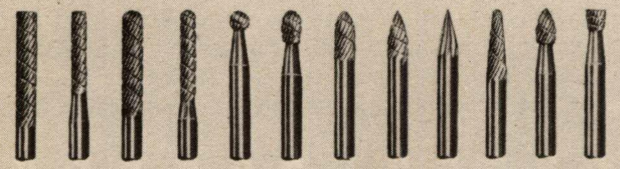
# MOTO-TOOL AND MOTO-SHOP ACCESSORIES

Made of finest high speed steel. Can be used for cutting, shaping and hollowing most metals, plastics and woods. They stay sharp longer, cut smoother. ⅛" shanks.



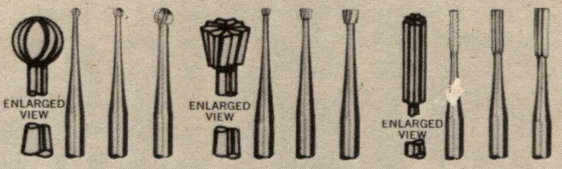
100 114 121 124 131 134 141 144 189 190 191 192 193 194 196 115 116 117 178 118 125 197 198 199

Carbide cutters outlast high speed steel many times over. While more costly, they prove more economical in the long run. ⅛" shanks with maximum cutting head of ⅛".



9901 9902 9903 9904 9905 9906 9907 9908 9909 9910 9911 9912

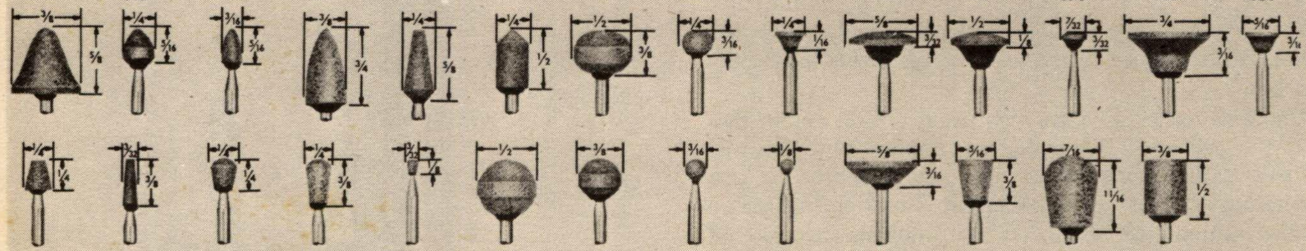
Ideal for engraving, carving, routing in wood, fibre, bakelite, soft metals; everything except hardened materials. 3/32" shanks only.




105 106 107 108 109 110 111 112 113

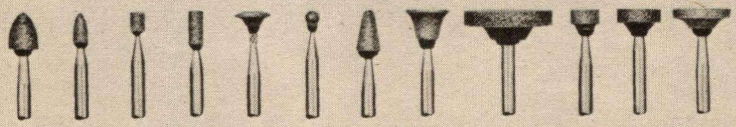
Highest industrial quality with long abrasive life. ⅛" Shanks.

941 943 945 952 953 954 962 963 964 971 973 974 981 984

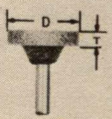


992 997 913 914 915 921 922 923 924 903 904 911 932

Made specially for working on hard steel, ceramics, glass and other hard materials. ⅛" shanks.



83142 83322 83642 83702 84382 84642 84922 85342 85422 85562 85602 85622




| Shape No. | Dia. | Thickness | Shape No. | Dia. | Thickness |
|---|---|---|---|---|---|
| 8143 | 1/8" | 1/8" | 8173 | 3/8" | 1/8" |
| 8144 | 1/8" | 1/4" | 8174 | 3/8" | 1/4" |
| 8145 | 1/8" | 3/8" | 8175 | 3/8" | 3/8" |
| 8146 | 1/8" | 1/2" | 8176 | 3/8" | 1/2" |
| 8149 | 5/32" | 1/4" | 8181 | 1/2" | 1/16" |
| 8151 | 3/16" | 1/8" | 8182 | 1/2" | 1/8" |
| 8152 | 3/16" | 1/4" | 8183 | 1/2" | 1/4" |
| 8153 | 3/16" | 3/8" | 8184 | 1/2" | 3/8" |
| 8154 | 3/16" | 1/2" | 8191 | 5/8" | 1/8" |
| 8157 | 1/4" | 1/16" | 8193 | 5/8" | 3/8" |
| 8158 | 1/4" | 1/8" | 8200 | 3/4" | 1/8" |
| 8159 | 1/4" | 3/16" | 8202 | 3/4" | 3/8" |
| 8160 | 1/4" | 1/4" | 8215 | 1" | 1/8" |
| 8162 | 1/4" | 3/8" | | | |
| 8163 | 1/4" | 1/2" | | | |

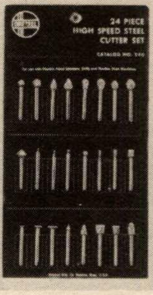
*All have ⅛" shanks.*

## Accessory Sets

### 24-Piece Cutter Set—No. 240

Consists of 24 high speed steel cutters in vinyl, fold-up storage pouch. For more information see the high speed cutter section above.

| | | | |
|---|---|---|---|
| 100 | 141 | 192 | 199 |
| 114 | 144 | 193 | 118 |
| 121 | 178 | 194 | 125 |
| 124 | 189 | 196 | 115 |
| 131 | 190 | 197 | 116 |
| 134 | 191 | 198 | 117 |




### 12-Piece Cutter Set No. 220

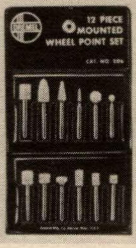
Consists of 12 high speed steel cutters in vinyl, fold-up pouch. For more information see the high speed cutter section above.

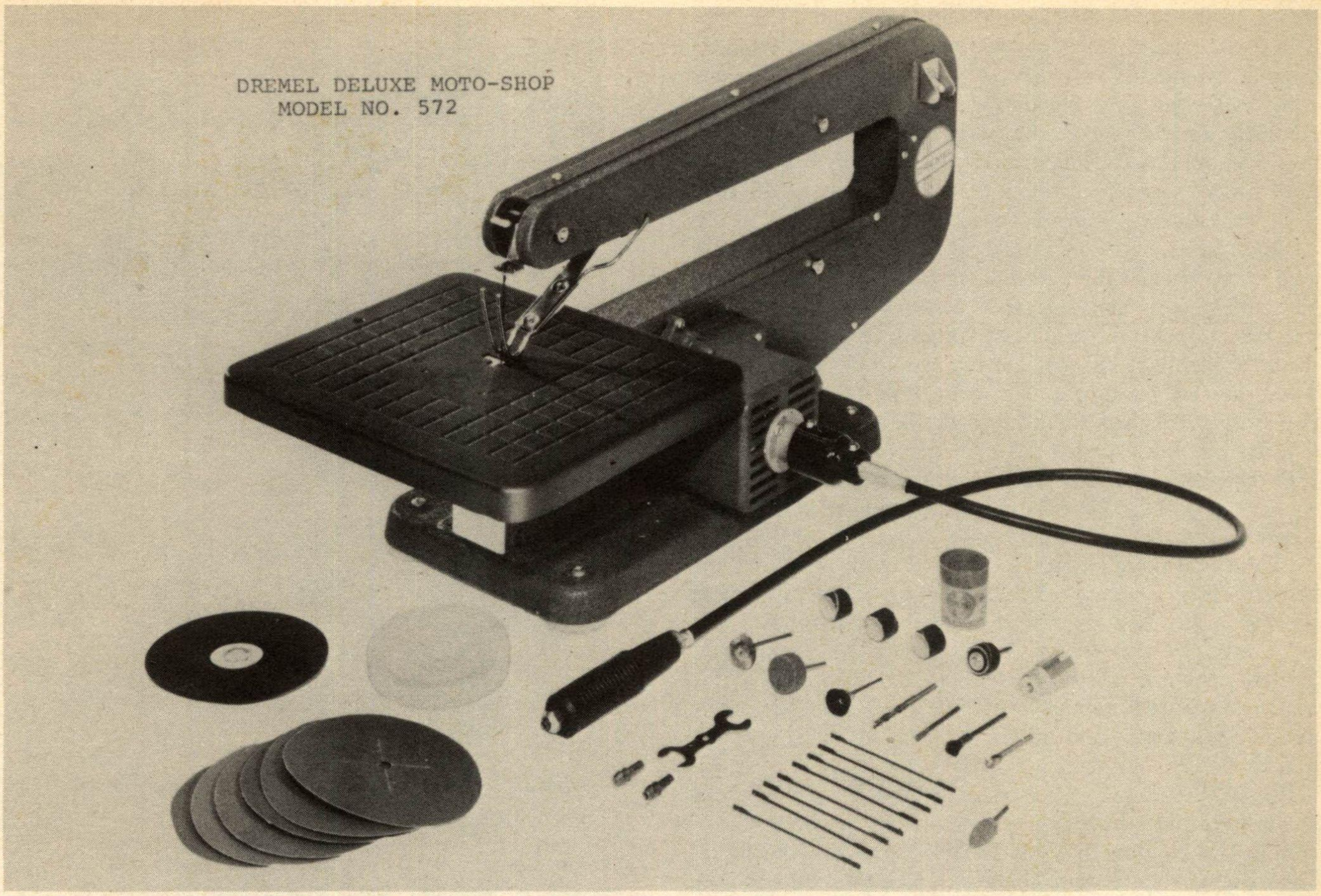
| | |
|---|---|
| 114 | 194 |
| 124 | 196 |
| 178 | 199 |
| 189 | 125 |
| 191 | 115 |
| 192 | 117 |


### 12-Piece Emery Wheel Point Set—No. 206

Consists of 12 industrial quality emery wheel points in vinyl, fold-up pouch. For details see emery wheel point section above.

| | |
|---|---|
| 952 | 8175 |
| 932 | 8174 |
| 953 | 8173 |
| 997 | 8163 |
| 922 | 8162 |
| 923 | 8160 |






*The Dremel people offer the Moto-Shop, which appears to be a power jigsaw but is actually six tools in one. Addition of a flexible-shaft power takeoff adds drilling, carving, routing and grinding capabilities. Tool also has provision for mounting disc sander and buffing wheel. Jigsaw will handle standard 2x4" lumber and ¼" steel.*

There are numerous good models available and you sometimes can find a good used drill press. The important factors are a zero to one-half-inch capacity chuck, and that the press be equipped with a variable-speed pulley arrangement. Visit gun shops, machine shops and other drill press users, plus gather data and prices before making your choice.

For some reason, most beginning gunsmiths feel that they just must have a metal lathe in their shop. This is a mistake. A lathe is actually the least used power tool and also the most expensive. It requires considerable knowledge and skill to operate. Most machine work is on small parts, a large lathe being required only for full-length barrel work. A good large-size lathe fully equipped will cost at least $2000 minimum. If you are determined to purchase a lathe, there are two under $2000 that I personally have used and would not hesitate to recommend.

The most useful and least expensive is one of the Unimat models. Although the standard size will fit in a suitcase, it is not a toy. In fact, the unit is capable of producing work in excess of most gunsmith's machining knowledge and abilities. It is available from gunsmith supply houses.

The next step up the ladder in size and price is the Atlas six-inch lathe with full equipment. This one requires permanent bench mounting. Its only limitation is eighteen inches between centers, and gears must be changed by hand. However, equipped with a milling attachment it is a favorite with all hobbyists and capable of precision work. If there is not a machine tool supplier in your town, check the yellow pages in the phone book of the closest large city for a source.

While I will not hesitate to use power equipment, I do so only when there is no sacrifice in the quality of the work. From my own experience of observing and training other gunsmiths, I am thoroughly convinced that too many beginning gunsmiths are of the opinion that expensive power equipment is a necessity for gunsmithing. The plain truth is that a thorough knowledge and acquired skill in using hand tools are the basic foundation of all top-quality gunsmithing. Power hand tools extend this foundation. Power equipment should only be acquired after the knowledge and skill are firmly established.

Finding a place to work is one of the major problems in gunsmithing. The kitchen table is the old standby, and more work is done there than any other place. Weather permitting, the usual picnic table in the yard is equally useful. With a little work at a minimum expense, a simple and easily made accessory can make either table more useful and eliminate table damage.

A section of one-half-inch thick A-D grade exterior plywood is cut to match the width of the table top. Place the knot-free A side up, the rough D side down. If desired, a section of heavy cloth can be glued to the bottom section to prevent scratching the table. Install 1x2-inch wood

firring strips around the edges with glue and nails. This edge will prevent tools and parts from rolling off the board. If desired, a block of 2x6-inch wood can be attached to one corner to hold your bench vise. Your work top is now complete and is held to the table with C-clamps when in use. Remove the C-clamps and it can be stored in a closet until needed. An added touch that will prolong its life span is a good coat of varnish or shellac.

An old desk, wood or metal, can easily be converted into a good workbench. Be sure the legs are firmly secured and all wobble is eliminated. If necessary, add metal angle brackets to achieve sturdiness. As most desks have a top made for writing, chances are that you will have to add a wood top for sturdiness. The same type of plywood top previously explained for kitchen tables works fine, except in this case the board is permanently bolted to the desk top. The desk drawers can be partitioned to hold your tools. A good adjustable lamp can be mounted on the desk to provide correct lighting.

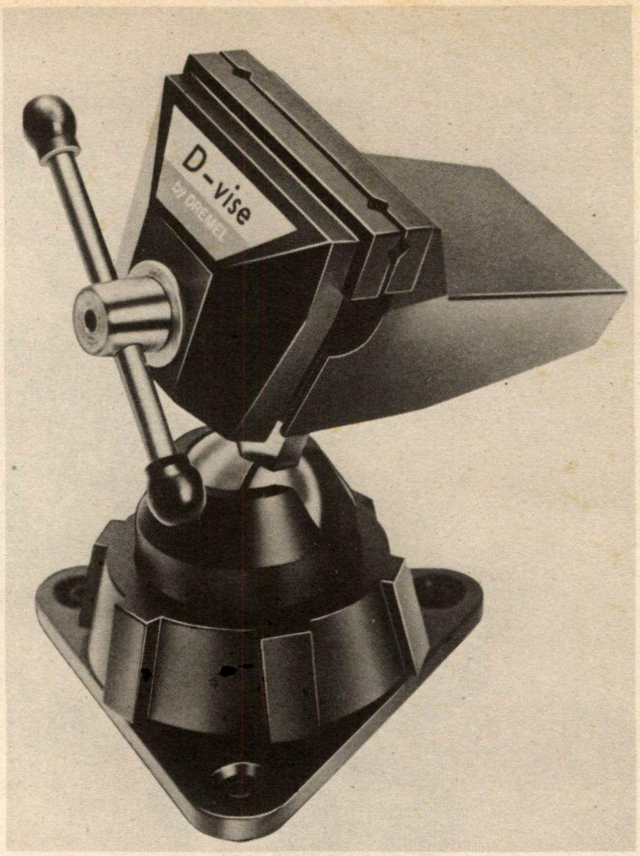
Wood and metal filings from your work on either the kitchen table or converted desk can be a problem to clean up after a job. Newspaper can be used as a floor cover, but is easily torn. A couple of sheets of inexpensive polyethylene paint drop cloths can be purchased at the local paint store for about $1. This is much stronger, can be reused many times, and makes the clean-up job simple and quick.

Either of these work areas can be used in the smallest of apartments and even mobile homes. They can be simple or complex, depending only on available space and ingenuity. Take a good look around the home, pick the spot and then spend some time planning how the spot can be utilized to its maximum potential.

One of the most irritating things in gunsmithing as a hobby is having to work in a temporary place. Each time you have to pick up the projects and keep up with small parts yet to be assembled, plus your tools. The obvious solution is a permanent work area or a separate small shop. Any small area in your home, such as the utility room, under the car port, the attic, the basement or extra room can mean hours of pleasure. Your work can be left undisturbed, waiting for your next free hours.

If you locate a work place in your home, be sure you comply with local laws. Extra care should be taken to provide proper ventilation and to ensure that no fire hazards exist. Too often the beginner rushes in and starts building his work area without first planning where everything goes. It is amazing how much can be arranged in a small area. One of my friends has the best planned work area I have seen in exactly half of a utility room under a carport. All of his tools fit in a compact workbench full of drawers and shelves. Power equipment is mounted on a piece of plywood that quickly bolts to his workbench. When not in use, each piece of equipment has its own compact storage place.

The best solution is a separate small building. Every large hardware company and mobile home sales company has a wide selection of small buildings that can be assembled or purchased as a complete unit. The lowest cost unit will be the one without any built-in components such as shelves, racks, etc. All you want is four walls, a floor and a roof. Then sketch the layout for your shop. Try several locations for every section. With a little careful planning you can make every inch useful. Watch for sales on lighting fixtures, plywood and other building material.



*Dremel's bench vise swivels and pivots to virtually any desired position; ideal for blackpowder gunsmith.*

Another source of a small work shop is a mobile home park. People are always moving and quite often you can buy a utility house for a fraction of its original cost. Construction companies generally build a work office on location. Many times you can purchase these at less than the cost of materials when their job is finished. In short, do not get in a hurry. Shop around and investigate every possible source.

Regardless of what type of shop or work area you finally decide to use, the main feature is the workbench. The first bench I built followed the usual recommendation of heavy construction. The top was made from 2x4s edge up! When I had finished and stood back to admire my new bench, it suddenly dawned on me how dumb I had been in building the thing! It would have held an army tank with a jumbo elephant in the driver's seat.

The plain truth is that ninety percent of professional gunsmith benches are built the same way. It is a massive waste of time and money without any practical advantage. Sure the bench should be sturdy, but one-inch plywood is all you need. You can use three-quarter-inch plywood if necessary. Plywood, due to its construction, has the strength of double its thickness in solid wood. Select A-D grade – the A side is knot free and is the work top, while the D side goes on the bottom. Use exterior grade, not

interior grade. The interior grade will not hold up under oil, water, etc., that always spill on the top of any bench.

Bench height is important. Try standing in front of your kitchen floor cabinets. Lay a gun on top. Is it too high to be comfortable? It all depends on your height. A good rule of thumb is a bench height two or three inches below your belt line. You then can work comfortably standing up or sitting on a stool.

Examine and closely study the construction of the simple workbench drawing. The workbench legs should be made first, using a carpenter's square to be sure each is square and matches the other legs. You will need one bench leg for each twenty-four inches of bench length. Don't be stingy with nails; use three each time you join two of the 2x4s.

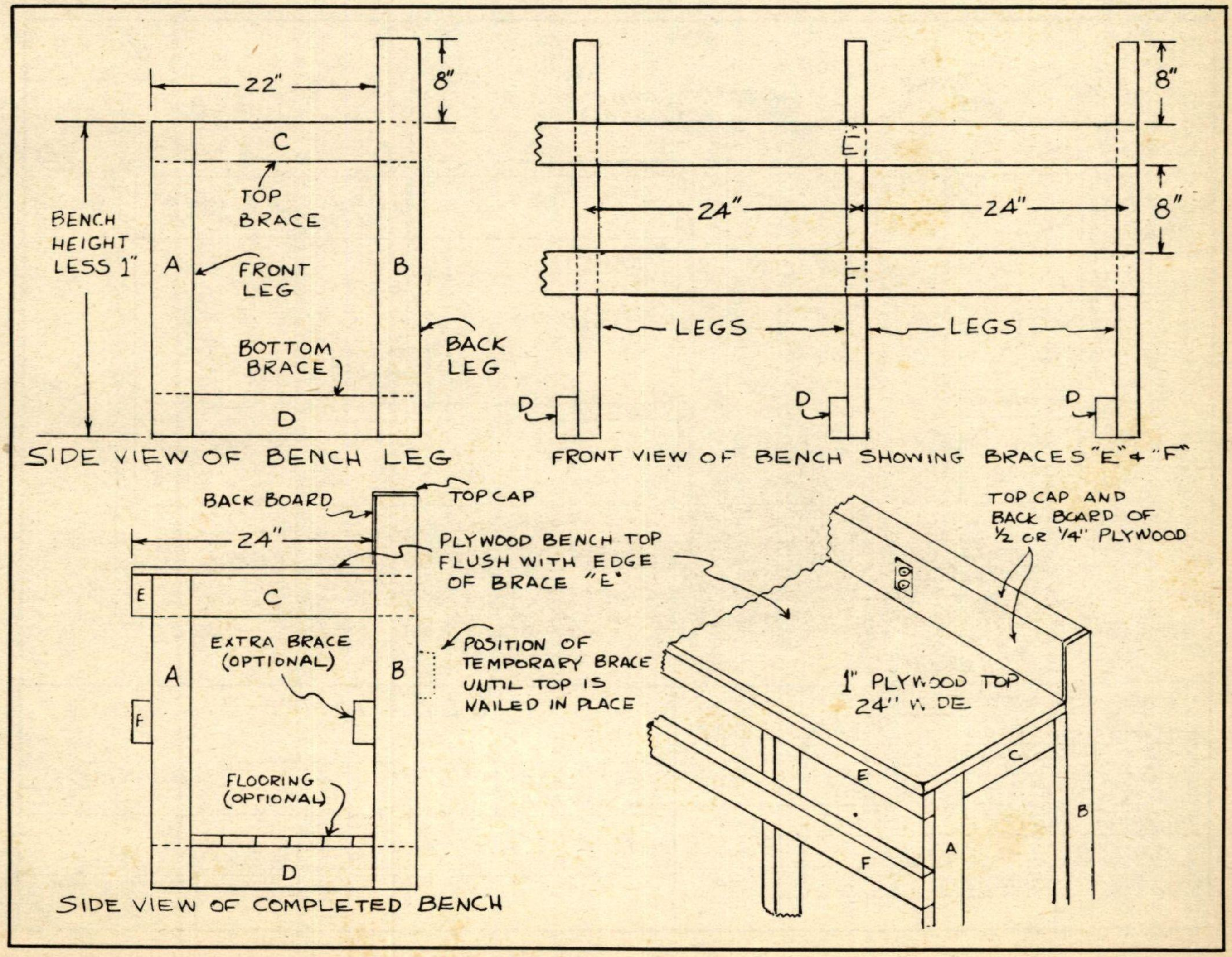
After you have completed the bench legs, lay them on the floor with the front up. Carefully measure the twenty-four-inch span on the braces E and F and use a scrap piece of 2x4 and the square to mark where they will join the front leg A. Have a friend hold the leg while you drive one nail almost flush at each junction. The reason for one nail is to allow it to be removed if you make a mistake. Now check with your square and, if everything is right, finish driving the nail and add two more nails at each joint.

Carefully turn the legs with attached braces E and F over until the bench is resting on the floor with the back legs up. Now measure and nail a temporary brace on the back until the plywood top is firmly nailed in place. You can make the temporary brace permanent if you wish to use it to bolt the bench to a wall.

The plywood top should be nailed firmly in place with finishing nails. Be sure to use a punch to countersink each nail to prevent scratching your work. The twenty-four-inch width is about perfect – additional width is unnecessary and awkward. The back board should be flush with the bench top to prevent screws and pins from rolling under. If desired, you can use a piece of molding at the junction.

Install electrical outlets on the back board. Use the current three-prong outlets and ground each of the outlets. Building codes sometimes require that the wiring be run in electric conduit pipe. You cannot have too many outlets, so put at least one at each bench leg. Use heavy-duty wire, as wire too small will heat up and can be a fire hazard. It is a good idea to seek the assistance of an electrical contractor in this part of your bench construction.

The top cap is nailed in place after all electrical work has been finished. You can make it flush, as illustrated, or extend it two inches in width, then drill holes in the extension to hold your screwdrivers, pliers, etc. Another use of a top cap extension is to serve as a shelf to hold a series of small, independent metal or plastic cabinets available at hardware stores, chain stores, etc.



Shelves above the top cap are dust catchers supreme and of little use. A much better arrangement is a twenty-four-inch-wide section of peg board. You can buy all types of hooks to hold your hammers, files and other similar tools. If you paint the peg board white, the tools are more visible and the white color reflects light down on your bench top.

The leg brace F is shown in the drawing eight inches below brace E that joins the plywood bench top. This is about right for a deep eight-inch drawer. This may seem too deep, but any less will be too shallow for large tools and accessories. However, it can be lower if you want to install parts cabinets in this space. Another choice is to make it into a shelf area, but the extra brace (optional) as shown on the side view of the completed bench will be necessary to support the rear of the shelf.

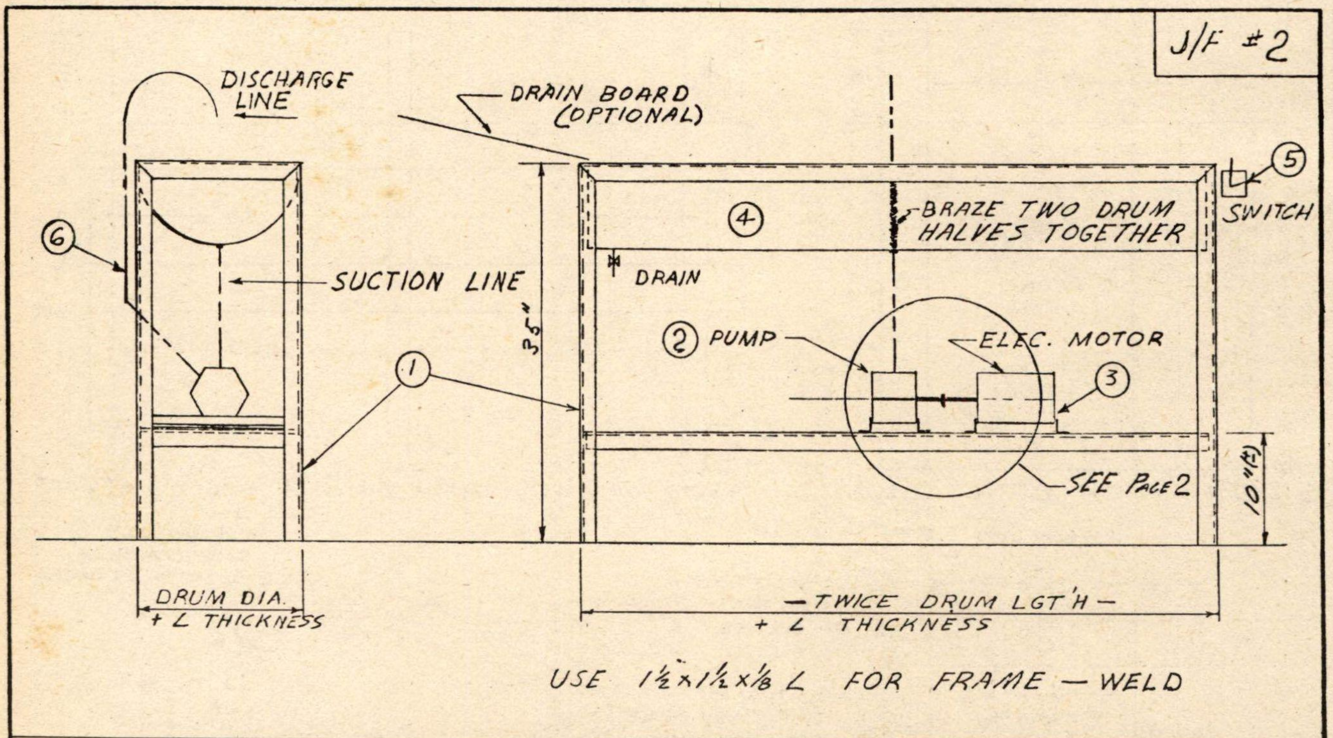
The optional flooring across the bottom brace D is easily made with separate planks of the other half section of your one-inch plywood, which is usually purchased in 4x8-foot sheets. It will have to be cut with notched-out sections for the upright (A and B) legs. This is a perfect example of careful planning before construction, as the floor is more easily installed before the braces E and F, or the bench top, are nailed in place. If you wish, lightweight one-quarter-inch plywood doors can be made and installed to cover either the top or bottom openings in the bench. Also, one-quarter-inch plywood can be added to the ends and back of the bench to seal out dust and dirt. These sheets of plywood, nailed firmly to each board, will make the bench extra sturdy as it serves as a solid brace.

As a final touch, give the complete bench a good coat of commercial varnish. Ask your paint dealer for the type of varnist used on gymnasium floors. It is the toughest type and will withstand a lot of abuse. The varnish not only preserves your bench, but also keeps oil and moisture from soaking into the wood.

The bench plans are purposely basic to allow modification to your own ideas. How sturdy is the bench? Well, the benches used on a full-time commercial basis in my two plants are based on this design and use the same legs, braces and top sections in wood thickness. The first one is almost 20 years old and is as sturdy as the day it was built.

The next item is bench lighting. Over the years I have found long, fluorescent lights about two feet above a gunsmith's head the best choice. The light is soft, fully illuminates the bench, and causes less strain on the eyes. Check your local dealer for the best buy and for his opinion in selecting the fixture that will match your requirements.

There are times when you will need more intense light, especially right over your vise. A good choice is the adjustable type that clamps on the side of a desk. You just




| # | ITEM | MAT'L | SIZE | FINISH |
|---|---|---|---|---|
| 1 | FRAME | STEEL | 1½x1½x⅛ | PAINT |
| 2 | PUMP | WASH. MACH. | | " |
| 3 | ELEC. MOTOR | | ⅛ HP(+) | " |
| 4 | DRUM | STEEL | 25 GAL(±) | " |
| 5 | SWITCH | 110 VOLT | | N/A |
| 6 | TUBE | COPPER | ¼" | N/A |
| | | | | |

CLEANER

SCALE: 1" = 1'-0" APPROVED BY DRAWN BY

DATE: 9/9/71

WALKER ARMS Co., Inc.

DRAWING NUMBER 1 OF 2

clamp it on the top of the cap board of your bench or the wall. Just be sure it can be pulled down and adjusted when needed, then swung up or to the side, out of your way, when not in use.

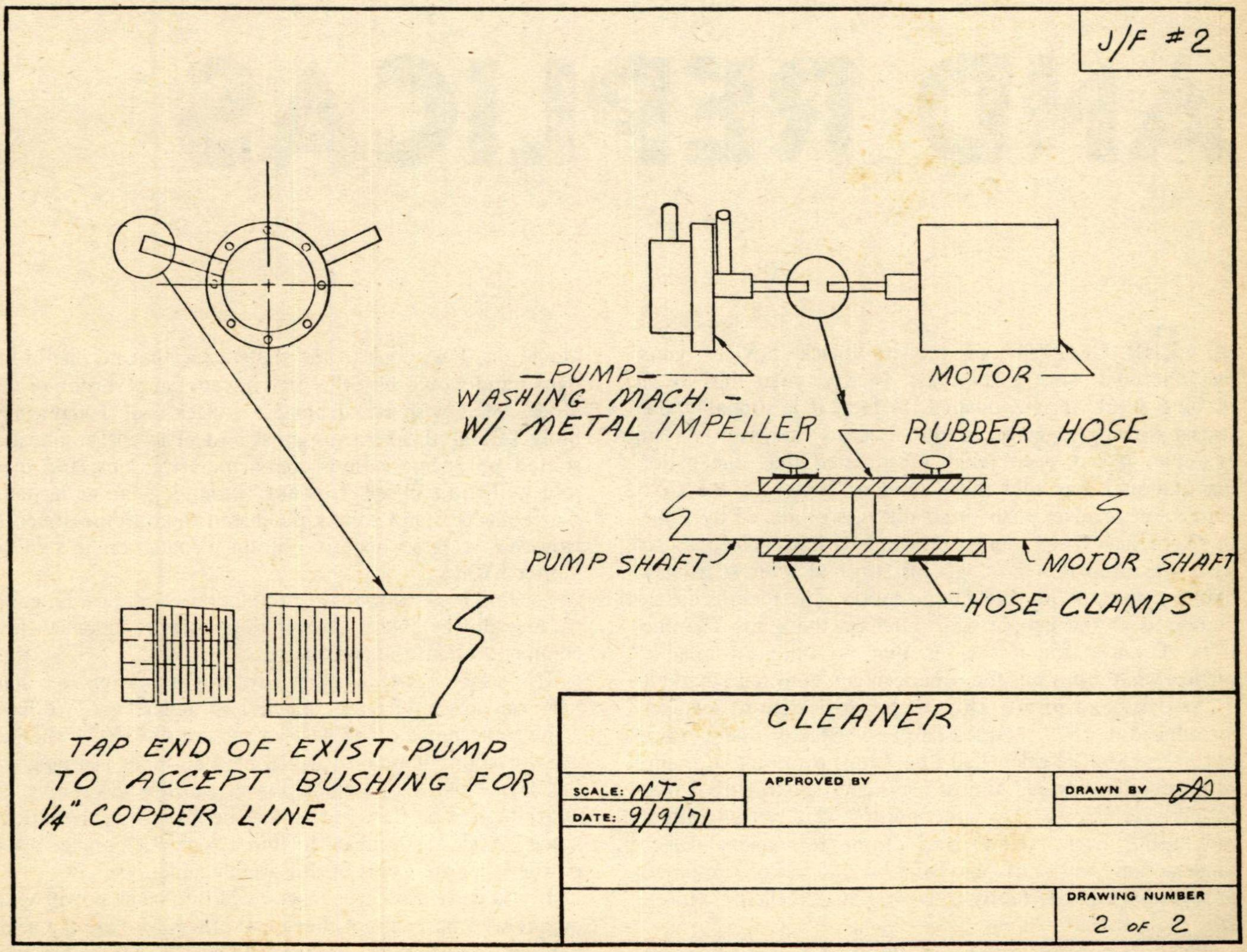
Heating and cooling needs depend on geographical location. If your shop is part of your home this usually is no problem. If you have a small, separate building, you will have to install some form of cooling and heating. The small total area of the average shop keeps the cost low. Normally, a regular window fan or a floor-type electric heater with a fan at the rear is more than adequate. Each can be stored when they are not required.

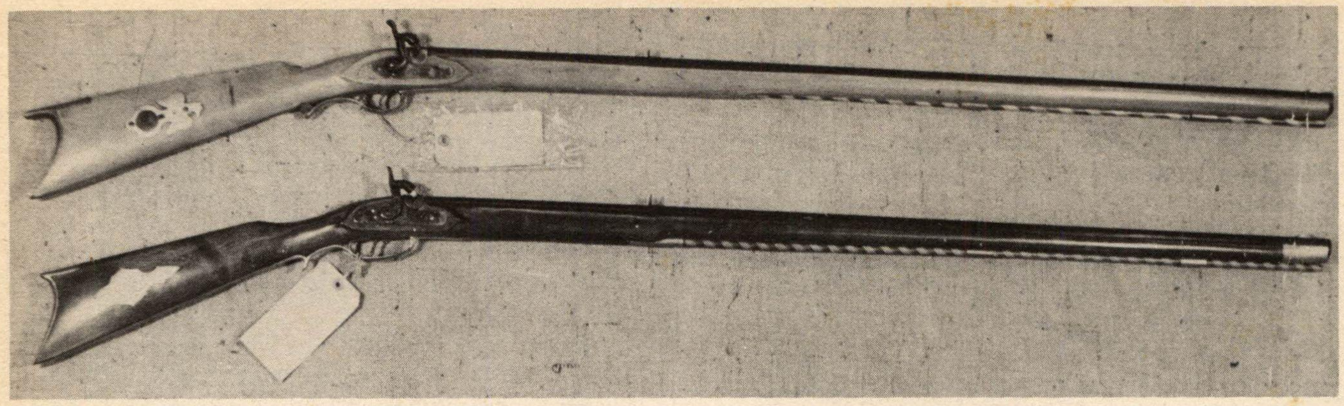
A cleaning tank can be purchased or you can make a good one from scrap parts right out of the junkyard. The drawing shows a tank that uses a small motor to continuously recycle mineral spirits. The steady flow out of the pipe washes away dirt, grease and other foreign matter as you use various types of brushes to loosen the crud found in most guns. With a flip of the switch, the pump stops and you can allow a part to soak overnight or longer to loosen rust. The original model is well over 15 years old and the only maintenance has been to clean out the pump and install another piece of rubber hose that connects the pump and motor as a flexible shaft.

Mineral spirits probably is the safest type of cleaning solution. It has a flash point well above kerosene and leaves no residue on gun parts; but it will dry out the natural oil in your hands. I would recommend that you buy a pair of neoprene gloves similar to the type used to wash dishes in a kitchen. Adequate ventilation is a must. Under no circumstances should gasoline be used to clean a gun. Even the smallest spark from two pieces of metal striking each other will ignite the fumes. It is best to locate the cleaning tank outside if working in a small shop. When not in use, it can be covered with a painter's drop cloth or section of polyethylene plastic.

Start off with the absolute minimum in a work area. The more jobs you complete, the more you will understand what is required in a permanent shop. Take your time and thoroughly investigate every possibility. Once you have selected the area, again take your time in thorough planning. You can pick up ideas by visiting any type of repair shop, large or small. A lot of ideas that I use in my commercial plants have come from visiting television repair shops, appliance repair, etc. Finally, make sketches of exactly what and where every item will be located in your shop.

You either plan it before or modify it after you discover the mistakes. If there is one golden rule in building your work area or shop, it is a place for everything and everything in its place.





*Many black powder replica guns sold in the United States were and still are produced in Europe or the Far East for import. Rifle at top is prototype number 2 and lower is serial No. 1 from Dumoulin, France, factory.*

## CHAPTER 5

# REPRODUCTIONS AND REPLICAS

THE GROWTH of modern black powder guns manufactured during the past twenty years has been nothing short of phenomenal. In fact, it is probably the fastest-growing segment of the firearms' industry. As an example, it has been reliably estimated that one major manufacturer has sold more modern copies of the Colt percussion revolver than originally was produced by Colt!

There have been numerous explanations voiced as to what has been the cause of this surge of interest. In my opinion, there is no single explanation. The reasons are as numerous as the people who purchase the guns. The one thing I know for a fact is that no one can reliably predict what motivates the American gun consumer market.

As an example, the Colt single-action revolver introduced in 1873 retained its popularity for many years, but in the 1940s dealers had a hard time disposing of them, so production ceased. Almost overnight, single-actions that formerly sold for $10 in fair condition were bringing prices over $100. Even introduction of the top-quality Ruger single-action was not enough. In 1955 Colt resumed production and currently there is an excellent market. Why?

When Winchester produced its 1966 Commemorative Model 94, I was one of the first to say that no one in his right mind would buy this high-priced, fancy version of the Model 94. I wish I had bought a truckload! Today, they bring several times the original cost. The entire industry started producing various commemorative guns, and they sold well and still sell. It is not beyond logic to understand that collectors and others purchased them as investments. However, a large majority of the production is sold to hunters! Why?

Getting back to modern production black powder guns, we may not be able to answer why, but we can make a few comments about the purchasers.

It is a fact that technology advances at a faster pace than man can absorb its use, much less understand. We have come to accept the fast pace of modern life. Yet, whether we will admit it or not, we all have an inner yearning for the days when the pace was slower and life was simpler to understand. You have but to see the interest in the various home crafts and hobbies to find a perfect example. Black powder guns are a part of this overall category.

If you delve even deeper, you will find black powder gun buyers who never shoot them, and others who use them for hunting, while their modern firearm rests in the gun

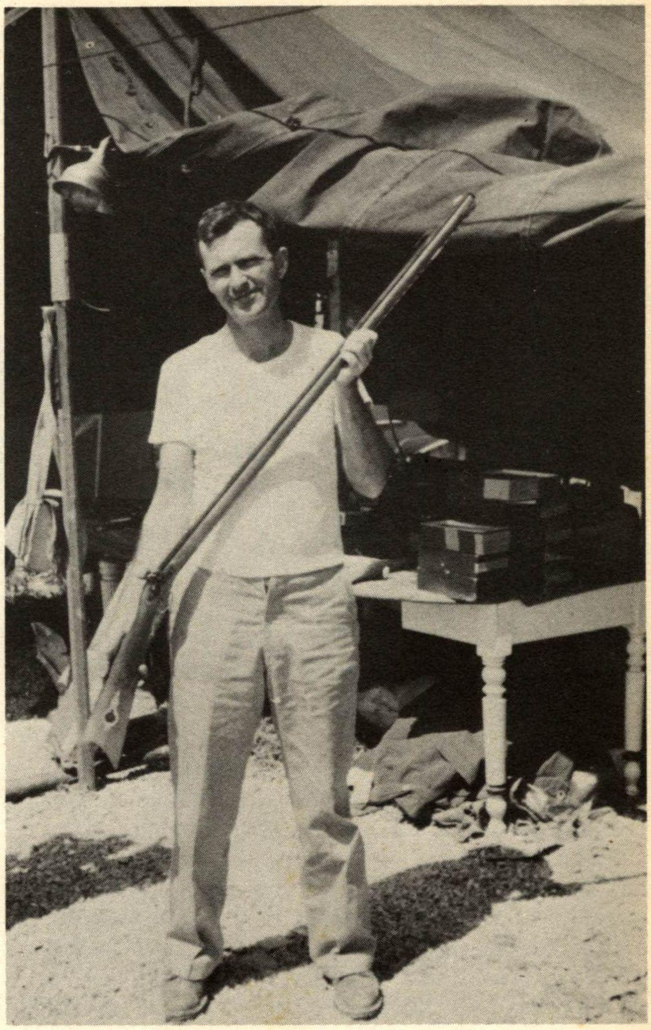
# Their Phenomenal Growth Has Created A Demand For Specialized Gunsmithing

cabinet. In both cases, they represent that slow-paced, simple life-style.

Furthermore, many people tire of seeing dozens of other hunters using the same exact model gun they have. Thus, the increase in custom or customized guns. Black powder guns are just a step farther away from the common herd, but for the same general reason.

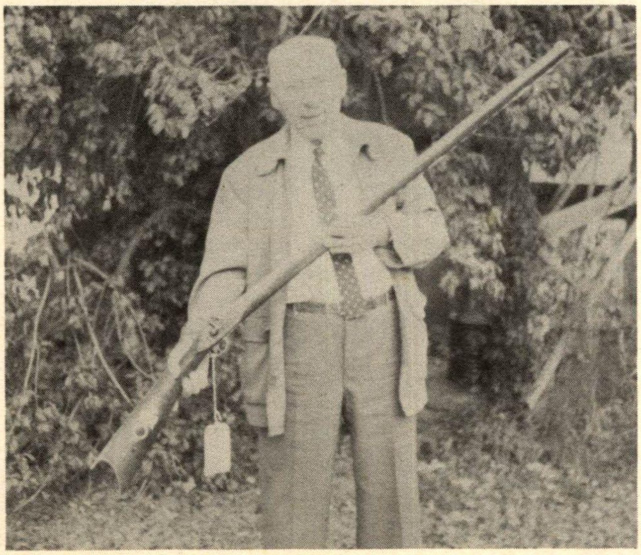
Add another factor and we begin to understand the popularity of muzzleloading black powder kits: They allow individual variations, including numerous personal touches to make the gun one of a kind, rather than just a standard factory version.

Another interesting point concerns the skilled sportsman. As his shooting becomes more and more proficient, he starts to yearn for more of a challenge in taking game. This is a factor in the increasing popularity of single-shot cartridge rifles, handguns and even shotguns. The challenge is amplified for he knows that the one shot must be placed exactly right. It is not difficult to understand that it is only a matter of time before shooting skill decreases the challenge. The next obvious step is the percussion muzzleloader, and then the flintlock front-feeder.



*One of the first Dixie Gun Works rifles produced for then-fledgling modern muzzleloading sales era. Production and use of such guns opens many opportunities for the black powder gunsmith.*

*Turner Kirkland, Dixie Gun Works, Union City, Tennessee, was selling black powder rifles more than twenty years ago at national matches in Indiana.*



Finally, there is just the plain fun of shooting black powder guns. It is a combination of reloading ammunition, that one-shot challenge, nostalgia, reliving history and a dozen other motivations all rolled into one gun.

Regardless of the reasons or motivations, black powder guns are here to stay and the ranks of owners grow daily. Where there are guns, regardless of type, there is an equal need for the gunsmith's art. Black powder guns are no exception, and the need increases in perfect ratio to the sales.

Black powder gunsmiths have always been around. Some had well-equipped shops, others were tucked away in a backyard, and still others existed in the less populated areas that looked like a step back in history.

I grew up in the waning years of the everyday use of black powder guns, saw it reach its lowest ebb, and now its virtual rebirth. I do not claim to be an expert, but I do know what was fact in their use and the practical requirements of gunsmithing black powder guns.

I have no argument with those who choose to duplicate

*From left: an Idaho guide, Elmer Keith and Turner Kirkland hunting elk on Idaho's Snake River, 1957.*

black powder gunsmithing as it was practiced two hundred years ago, using the same type antique tools and equipment. I admire these purists; they turn out top-quality guns due to their skill in spite of their tools' deficiencies.

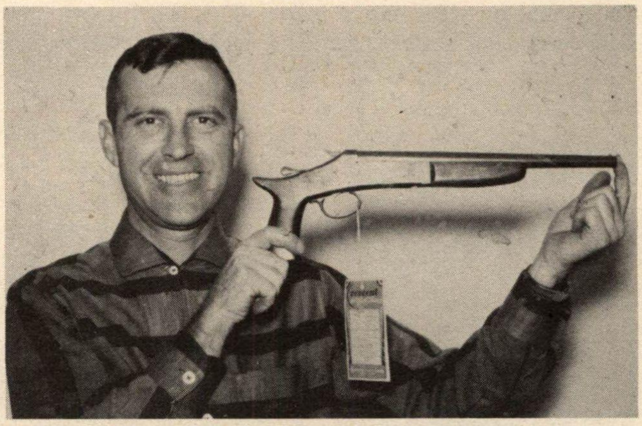
I do feel they lose sight of an important factor: The gunsmith of yesteryear was not in the profession for the fun of building a gun. He was no different than today's professional gunsmith in that he depended on his trade to earn a living. He would not hesitate to use a more efficient tool or technique, provided it did not decrease the quality of the gun.

Duplicating black powder gunsmithing of yesteryear with the tools of even fifty years ago is fine for the hobbyist with another primary source of financial income. Try it as a full-time professional gunsmith, and the chances of a long career will be slim. To be perfectly honest, even with modern tools and equipment, today's professional full-time gunsmiths do not have a financial bed of roses!

Gun buffs, be they collectors, accumulators or hunters, constitute only about twenty percent or less of the gun-buying public. The other eighty percent will buy a good gun, then throw it in the back of a pick-up truck and pile a half-dozen dogs on top. They drive for miles over dusty roads, shoot a gun just as long as it will function, stick it in a back closet and ignore or forget even the simplest forms of cleaning and maintenance. From all appearances, black powder guns are starting to receive the same treatment. Hence, another growing requirement for black powder gunsmiths; for, unlike modern cartridge guns, a muzzleloader is less forgiving of such treatment.

Another demand for black powder gunsmithing is that modern replicas, with few exceptions, have not received the final hand-fitting of parts and components the originals received. It is another example of black powder guns not being as forgiving as modern cartridge and shell guns. The average across-the-counter muzzleloader will give average results, but only average. In the hands of a skilled black powder gunsmith, it can be adjusted, regulated and tuned to produce accuracy and efficiency almost double that of one not receiving the same treatment.

There are exceptions, of course, but they are few and far



*Rise in value of older firearms has helped draw black powder guns to attention of modern shooters, collectors. Crescent .410 single shotgun pistol from Shapner Hardware sold for $29.95 in 1957; it's now worth several times that price, if and when one can be found.*

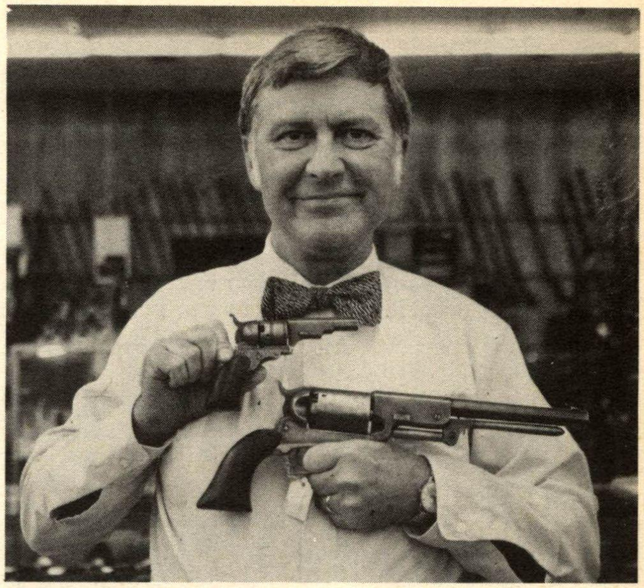
between. This does not mean that modern black powder gun manufacturers turn out junk guns. Hand-fitting of parts and components can easily double the cost of production. To keep the cost of their product within reason, they have no choice but to machine as close as possible and keep hand-fitting to a minimum. It is just a simple financial fact of manufacturing any product.

A source of income for the semi- or full-time professional gunsmith is in the building of a gun from a kit. Too often, the beginner takes on a complicated kit when he should have started with one requiring less skill and knowledge. The end result is that he gets stuck or fouls up the job. His only choice is to seek the assistance of the semi- or full-time professional.

There is no disgrace in the beginner starting with a simple kit that requires few tools and little knowledge. In fact, it is a sign of intelligence. As skill and knowledge increase, he can progress to the more complicated kits. It is the same basic principle as purchasing tools. Go slow! You will enjoy the project and receive a lot of self-satisfaction in a job well done. After all, half the fun is in building the kit and the other half in looking forward to the next one with more challenge.

As your skill and knowledge increase, your finished products will attract another segment of the black powder gun followers. These are people who do not want a regular across-the-counter production version. They want an individual version built to their own ideas; in other words, a custom muzzleloader. At the same time, they lack either the skill or desire to personally build a gun from a kit. The available materials range from a personalized kit assembled, to a gun built from combining individual parts and components.

Many of today's top, professional black powder gunsmiths started out by building a simple kit for their own pleasure. The demand for their quality products opens up a complete, new full-time profession. Some build only personalized kits. There is another, larger group that uses commercial components. The top of the lot will build a gun



*Many early black powder firearms are sold today for staggering prices. Colt Pocket Paterson, .34 caliber, three-inch barrel was recently for sale at $2450., while Colt Walker A Company, below, was offered for $5500.*

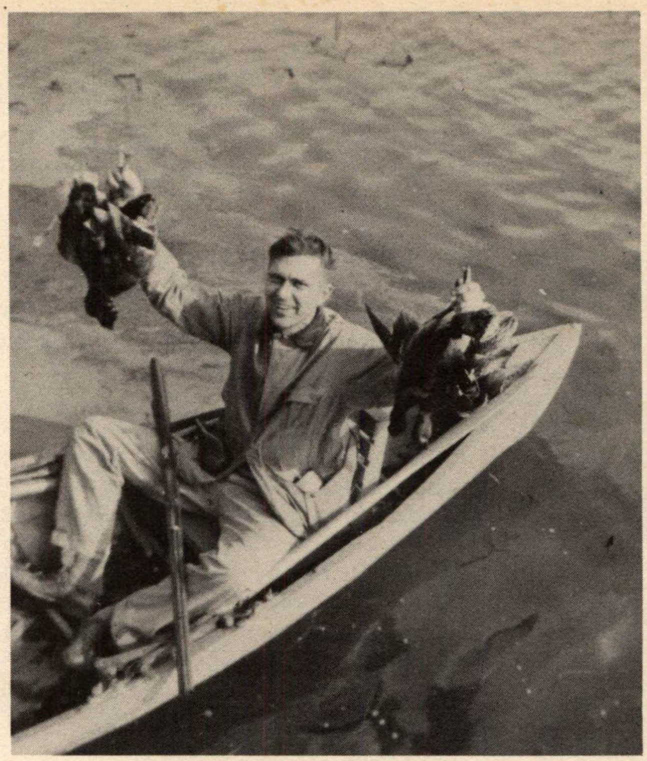
from raw material, lock, stock and barrel, with the finished product bringing $1000 or more!

Modern black powder guns are, in many respects, superior to the originals. For one thing, there is no question that the barrel steel is superior in quality in all except the extra cheap, shoddy examples that the get-rich-quick crowd dumped on the market to take advantage of the current trend. These are easily spotted in just a few minutes of close examination. All of the reputable companies have taken extra precautions to assure good barrel quality for safety.

While I realize that today's octagonal barrel is the same diameter at both ends to keep production costs down, I do

*Serving black powder shooters and hobbyists has advanced Dixie Gun Works from a one-man operation to a modern plant. This building was built in 1969 in Union City, Tennessee, and houses more than 46,000 square feet of working space.*

*As more duck hunters turn to the challenge of the muzzleloading shotgun for game, the number of potential jobs for trained black powder gunsmiths will increase.*



feel that a slight taper toward the muzzle would not increase cost excessively. Few original octagonal barrels were the same diameter across the flats at both ends. The longer the barrel, the heavier the muzzle and lack of balance with an untapered barrel.

It is a simple matter to alter a straight diameter barrel with a milling machine. Any good machine shop can do the job. All that is required is that you provide the exact dimensions you desire at both ends. They do not have to be gunsmiths, only knowledgeable machinists with the correct equipment. There are several black powder barrel makers who will either furnish a tapered barrel of their own or make the alteration on your barrel.

It is even possible to duplicate the process by hand in a home shop. The three basic tools are a set of good files, a dial caliper, and a long, straight-edged piece of steel. The other three requirements are determination, patience, and a lot of elbow grease.

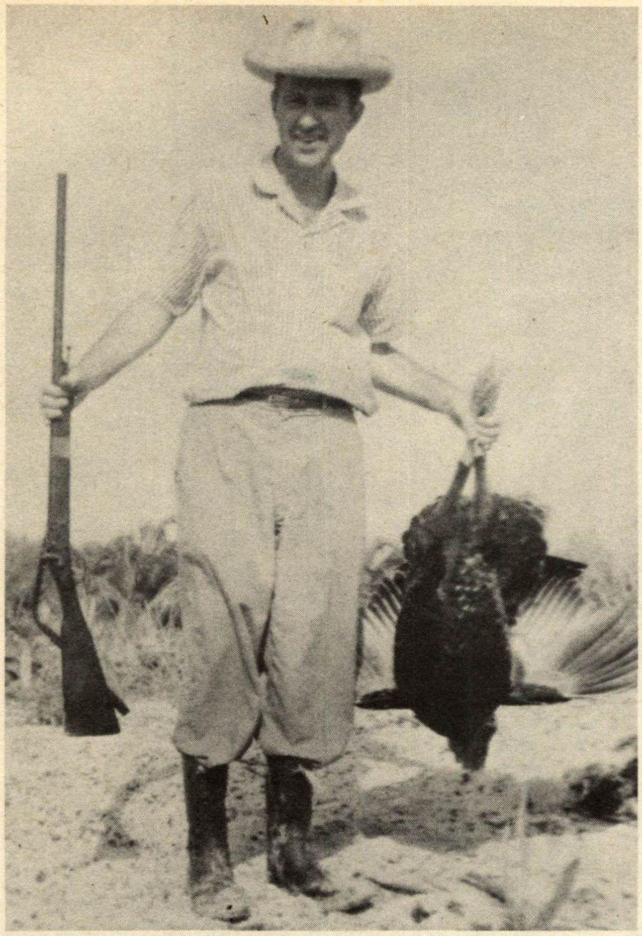
Just to illustrate the method, let's assume you have a thirty-inch barrel measuring one inch across the flats and you want the muzzle to measure one-half inch across the flats. Naturally, this is excess taper, but the dimensions given are used only to keep the illustration in simple figures.

First, you have to reduce two opposing flats until they measure one-half inch combined. Since there are two flats, the half-inch reduction is divided by two to give one-quarter-inch reduction of one flat. The other flat also is reduced one-quarter inch, but not until the first flat is completed. Half of the thirty-inch barrel is fifteen inches, so the reduction of one flat is half of the one-quarter measurement or one-eighth inch at the fifteen-inch halfway point.

After the barrel is secured on a smooth, level surface, you start draw filing. After several strokes, you stop and measure. At the fifteen-inch halfway point, the final measurement is one inch less one-eighth inch or seven-eighths inch total. The muzzle end is one inch less one-quarter inch or three-quarters inch total. Thus, one flat has been filed to finished taper.

Naturally, it takes a series of measuring and filing; use of the long straight-edge will easily reveal any dips and waves. When one flat has been correctly reduced, this side goes on

*Dixie Gun Works' first catalog in 1953 featured this trio of black powder enthusiasts: from left, Bull Ramsey, Turner Kirkland and Pop Neidner of Neidner Gun Sight and Indian fighting fame.*



*In 1957, Turner Kirkland hunted turkeys on the Yucatan Peninsula with muzzleloading gun and knickers.*

barrel measurement easier, and in one-foot increments there will be less chance of error.

Just reading about how involved tapering a barrel by hand is, much less doing the job, should make you appreciate and agree that gunsmithing is an art. As you go deeper into the building of a gun from raw material or even rough castings, you'll probably agree even more.

Building a stock is easy. You just take a piece of wood and cut away the part you don't want! It sounds like a joke, but that is exactly what was done in original gunsmithing. Stockmaking, like metalwork, also is an art not easily learned and mastered. Many of today's black powder gunsmiths purchase a stock blank; a flat board that has been rough sawed to the basic outline of a stock. It is not for the beginner!

Next is the rough profiled stock, which means that the initial shaping on the outside is done, but there's plenty of wood yet to be removed and the stock shaped to individual preference. Rough inletting, or fifty percent inletting, means that the stock has wood removed to accept the barrel and components at the correct position, and in

*Muzzleloading gun kits are popular and numerous, but not necessarily new. Kirkland produced his first kit and posed for photos in 1937. Photo reversed when printed.*

the flat surface holding the barrel and you begin on the direct opposite flat.

This time the final dimensions will be at the fifteen-inch halfway point, seven-eighths inch less one-eighth inch, or six-eighths inch. Remember, you already have removed one-eighth inch from the opposing flat. The final muzzle measurement will be three-quarters inch less one-quarter inch, or one-half inch total.

With the two flats tapered, turn the barrel ninety degrees and begin on the next two flats. Use the identical procedure. You now will have four flats tapered and four flats in the original dimension. The last four will require less metal to be removed, as their edges already are tapered.

Easy? No, it is a lot of hard work, but this is exactly how an octagonal barrel was tapered before machine grinding or milling. As previously stated, the example dimensions were exaggerated to simplify the explanation. If you do decide to try the process, ask a machinist to compute the taper per foot. These specifications will make

*Kirkland was collecting and showing muzzleloaders in 1939, displaying a typical flintlock Kentucky rifle.*

relation to other components, but with all final inletting yet remaining to be done. The two forms are sometimes combined, and are for the more advanced stockmaker.

The beginner should select a kit that has ninety-five percent of the stock shaping and inletting completed. If he will exercise a little patience and go slowly, he can complete the remaining five percent fairly easily, using a minimum of tools to produce an end product equal in quality to a professional job. However, if he tries to do the job between lunch and dessert he can easily foul up the best kit!

The whole purpose of a black powder kit is to eliminate the more complicated aspects of the gunsmithing art. Kits are intended to provide pleasure in the act of completing the building of the gun.

There is ample latitude for individuality in the most simple of kits, but the basics must be completed first. The basics are the final five percent inletting of the barrel into the stock, the lock inletting into the stock, and properly inletting the trigger assembly. Then, and only then, are individuality in the final stock shaping, attachment of accessories, stock and metal finishing, and other aspects that do not interfere with safe and correct gun function, added to give the personalized appearance to the gun.

The available individual additions are almost without end. The accessory market abounds with items that can be added to the kit. Slings, sling swivels, special sights, cases for both carrying and displaying, various shaped inserts inletted into the stock, powder horns, flasks and measures, cappers, etc., are but a few. This does not include the wide variety of stock stains and finishes or the available metal finishes. All are a matter of personal preference, with enough variations to make any completed kit a one-of-a-kind gun.

Besides the large number of gun kits, there are three other basic kits that can be purchased to help finish the job. Each is designed to provide all the required material and the necessary instructions. Stock-finishing kits are the best procedure for the beginner and there's a wide variety from which to choose. Next is the metal-finishing kit, for either the browning or bluing process. Finally, there's the basic accessory kit, which contains powder measure, patches, grease, cappers and either finished bullets or moulds to use in making the correct bullets. The various kits have helped a lot in getting the new black powder shooter started on the right road, and are one of the reasons for the revived growth of black powder guns.

The rifle, in one form or another, has always been the

glamour gun, and today's modern black powder models follow the same trend. I have no argument with the rifles in general, except for this one small point: The earlier versions of reproduction-replica rifles basically were patterned after the guns used during the Civil War. Blue and gray teams grew in number at public target shoots, but a lot of the guns saw duty in the hunting field. The Springfields, Enfields and Zouave reproductions in .58 caliber led the pack in popularity. While there are several variations of each, a lot of fertile ground still exists for other model guns of the same period.

Following the original trend in hunting gun requirements, the half-stock plains or Hawken-type rifles dominate the market. Calibers generally are .50 and .54, with some in .45 caliber. Kentucky or Pennsylvania rifles, following the same caliber range from .45 to .58, are correct for deer and larger game.

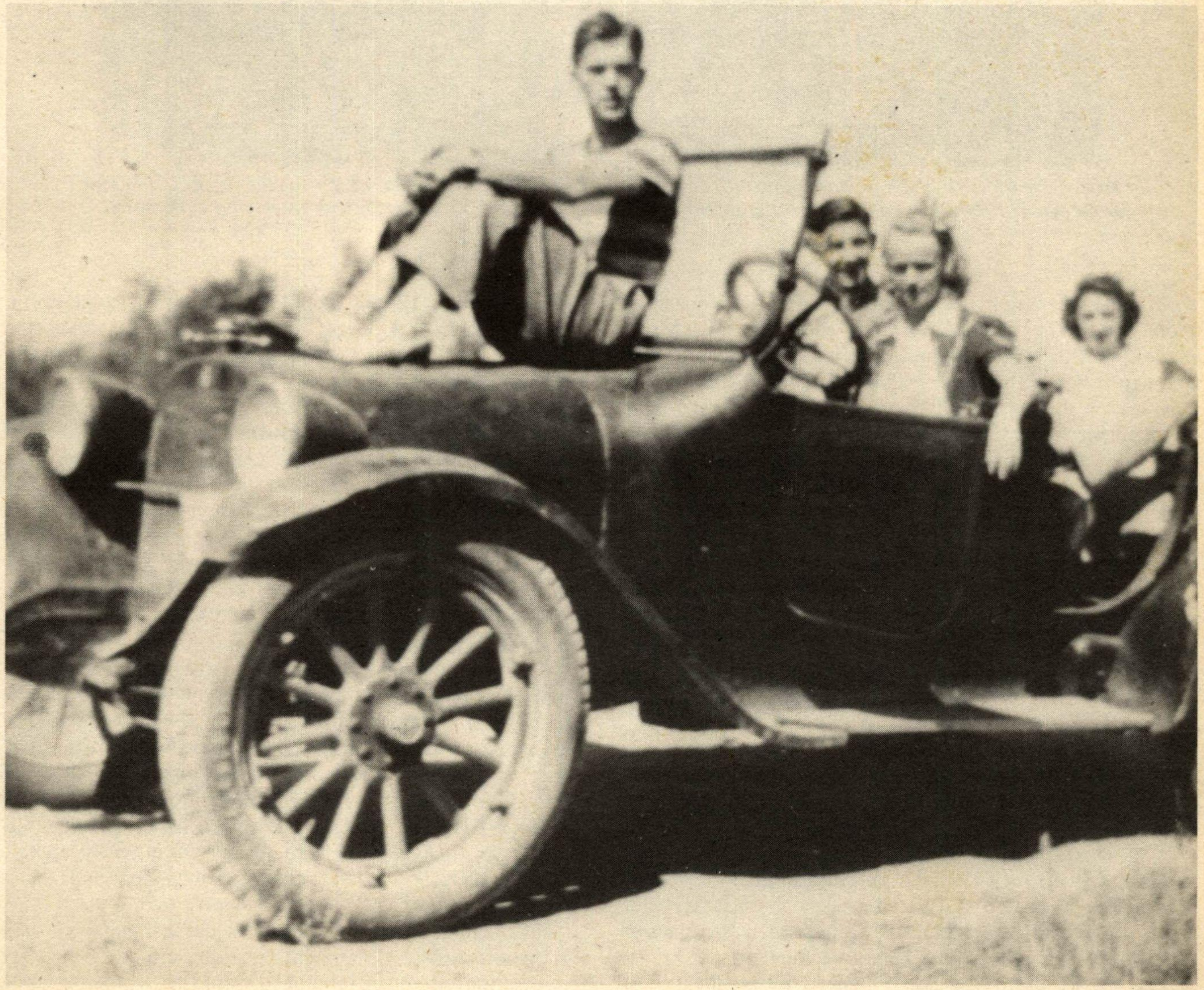
It is my personal opinion that an entire market is being overlooked: a muzzleloader suitable for the more plentiful small game, such as rabbits and squirrels. Hit one of these with even a .45 round ball and little is left for the skillet! Your reward usually is just a big hole with some fur around it.

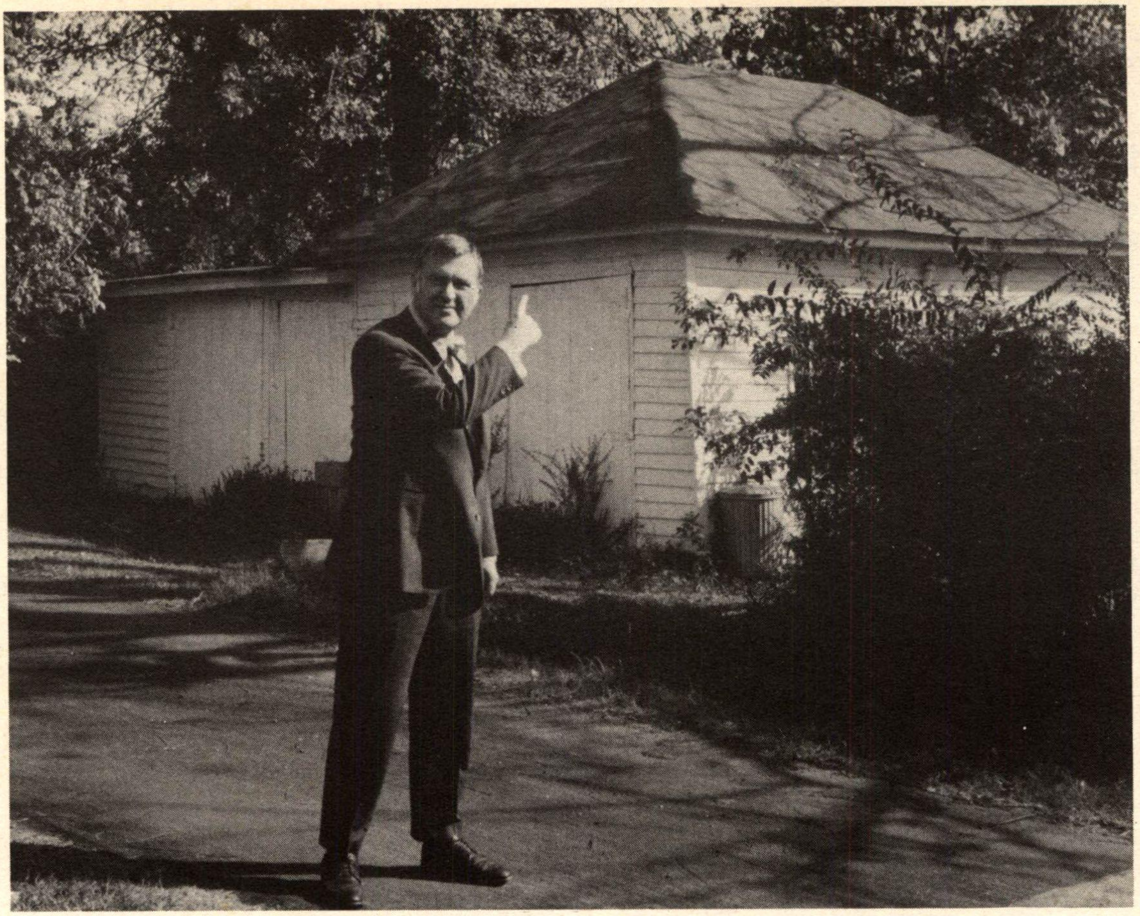
Even the .36 is too large for small game. The .30 caliber round ball is about ideal, weighing just a bit over 40.0 grains; which equals the popular .22 long rifle rimfire cartridge. Velocity also is about equal. Oddly enough, to the best of my knowledge only Dixie Gun Works and Hopkins and Allen offer .31 caliber rifles.

The most common criticism is that the bore fouls up too easily. From personal experience, this is a bunch of bull. In my boyhood days I enjoyed a lot of small-game hunting with a .31 caliber rifle using a .30 caliber patched round ball. Around 1955, I picked up a nice little half-stock percussion rifle in need of repair. The barrel was exactly thirty inches in length and, after cleaning the bore, I found that it took a light patched .28 caliber ball. I restored the rifle, made a mould to cast a perfect round ball, added a small powder horn and after various load tests, ended up with a 30-grain powder charge. It performed perfectly on squirrels.

Powder fouling? In both rifles I cannot remember a

*The Dixie Gun Works building includes an antique car museum. Kirkland collected this 1921 Dodge in 1938.*





*Perhaps the modern black powder gunsmith can grow, as did Dixie Gun Works, which started in an old Model T car garage in 1954. Company soon outgrew tiny facility by catering to the needs of shooters and collectors.*

single time when this was a problem, even after a dozen or more shots. The patches were soaked in hot Crisco and placed, with ball, in a simple short piece of oak board with holes to secure six patched balls for fast loading. Perhaps I was just a dumb country boy, who had not read that so-called black powder experts had decreed that bores less than .45 caliber fouled too easily to be practical. I just enjoyed hunting squirrels with both small-bore rifles. I only regret that both guns left my rack in the usual gun trading way.

Rifles in these calibers, once tried and backed by a few reliable articles in gun magazines, would help convince the shooting public. Incidentally, the first black powder handgun hunting I did was with a .31 Manhattan revolver. Small-bore squirrel rifles outnumbered the large-bore rifles back in the days of common muzzleloading hunting, why not now?

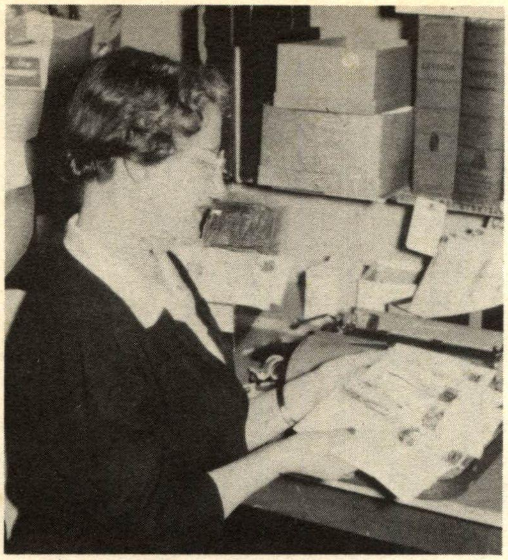
Thankfully, black powder muzzleloading shotguns are steadily growing in popularity. Several companies currently are offering excellent modern versions, some even with choked barrels to improve pattern percentages. A close friend with an overflowing gun cabinet of modern shotguns brings out an original thirty-two-inch 12-gauge double every dove season, and has often said that it makes his shooting a lot more fun – and he seldom fails to bag the limit. It never fails to draw a crowd, resulting in more converts.

So far we have discussed modern muzzleloaders in general terms. To the would-be black powder gunsmith, they can be a total involvement. As previously stated, the demand for specialized gunsmithing increases in direct ratio to sales and consumer use.

There is another completely separate field of black powder gunsmithing. This is the restoration of original guns. Up until the last twenty years or so, there was little demand for this work. A few top-notch, full-time professionals, who devoted all of their time to this field, existed in various parts of the country. Their work consisted primarily of restoration for gun collectors. A few regular professional shops with knowledgeable gunsmiths received a few local jobs, but would have ended up in the poor house had they depended entirely on restoration.

The growth of black powder shooting and modern reproductions-replicas have changed all of this. Value is based on one basic principle: supply versus demand. The price tag of original black powder guns has increased ten, fifty and even one hundred percent in many cases. Regardless of how well made, modern black powder guns can never replace the desire for an original to many people. Originals in good shooting condition will make a deep hole in even the fattest wallet. Those requiring only minor repair or restoration are just a few steps back.

The end results are a supply of original guns, one step from the junkyard, brought into gunsmithing shops for restoration; although rebuilding would be a more accurate



*In 1954, Dixie Gun Works had one part-time employee, Miss Ora Pace.*

description of the usual example. Consequently, the demand for black powder gunsmithing has increased, but so has the requirement for skill and knowledge. In a few words, it is definitely not the place for a beginner!

There are no longer any of the old-time masters under which you can serve as an apprentice to learn the necessary skills. Those that served such an apprenticeship are now so swamped with work that the available openings for apprenticeship are few and far between. Those engaged in the art simply do not have the time to train a new crop. It is further complicated by the flood of state and federal labor laws, minimum wage laws, and other regulations that make old-time apprenticeship training a financial disaster. So how do you learn the art?

The answer lies in the modern black powder reproductions-replicas. As previously outlined, you start with the simple ninety-five percent finished kit. You not only complete the kit, but also study every piece and component. What does every part do? When assembled with other parts to form a component, how do the parts work as a unit to perform a function? How does each of the components function together to make the gun work? These basic questions would apply equally to either an original or a modern reproduction-replica. Once you fully understand the function of each part and component, solving the problem of a malfunction is just a process of elimination. The source of the problem is a part or component not functioning correctly.

Once this is determined, the knowledge of how the part or component should be repaired is required. You then apply the skill acquired from building modern kits to make the necessary repairs. This is fine for mechanical problems, but what about cosmetic repair and restoration?

The only source of this knowledge is by closely studying the originals. Note every factor and every line. Museums, gun shows and private collections are the best source of study. Next is a well-stocked library. There are well-written books, small pamphlets and articles in the gun magazines that can provide a wealth of useful information and data.

I have never known a top professional gunsmith who did not study every source of information he could find. I have never understood how anyone can expect to become proficient at any skill without studying. Every scrap of knowledge man possesses has been acquired through the process of trial and error. It is simple logic to study available knowledge and thus avoid the mistakes others have experienced.

Slowly, but steadily, apply your acquired knowledge to building black powder kits or repairing modern reproductions-replicas. Your skill will steadily increase with each gun. Then, and only then, should you even consider the repair or restoration of an original.

Your first work on an original should be confined to simple work. Even the cleaning of an original will serve as a source of instruction. Self-discipline in restricting your work on an original to jobs you know you are qualified to perform is the mark of a craftsman. It is also the mark of a true professional to say, "I am not qualified to do this job." A gunowner respects a man who does not hesitate to admit his limitations. They have nothing but scorn for someone who tries to bluff his way and then falls flat on his face when he turns out a poor job. You do not buy customer respect in the gunsmithing profession, you earn it step by step, in a job well done.

Those of us who appreciate and enjoy firearms owe a dual debt of gratitude to the manufacturers and importers of modern black powder guns. They have provided reasonably priced black powder guns for us to enjoy building, owning and shooting that would have been impossible with the dwindling supply of originals. Perhaps more important, they have created such a demand that many originals that would have ended up as scrap metal now are being restored and preserved for future generations.

*Attending large and small gun shows with samples of work performed is an excellent way for the beginning black powder gunsmith to become known to customers.*

CHAPTER 6

# CVA'S GREEN RIVER KNIFE


# AND SHEATH KIT

This Beginning Project
For The Novice Gunsmith Provides Practical Application

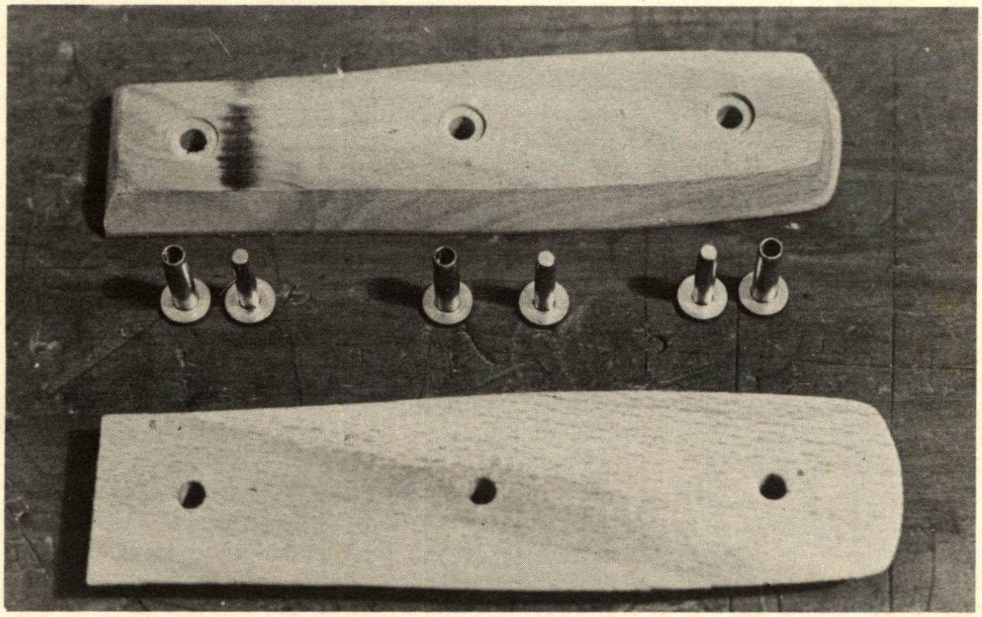
I HAVE ALWAYS believed that the best way to train a gunsmith is by practical application mixed equally with theory, written or verbal. The first project should not be just filing a piece of metal or cutting a section of wood for practice. The project should teach this, of course, but the end result should be an item with a practical and useful purpose.

When Connecticut Valley Arms, Incorporated, sent one of their new Green River knife and sheath kits for comments, it was exactly the type of kit I wanted to use as the first project. Easy to assemble using a minimum number of tools, the kit is inexpensive and the finished product is useful to any black powder shooter. As an added bonus, it is top quality with a lot of historical and interesting background.

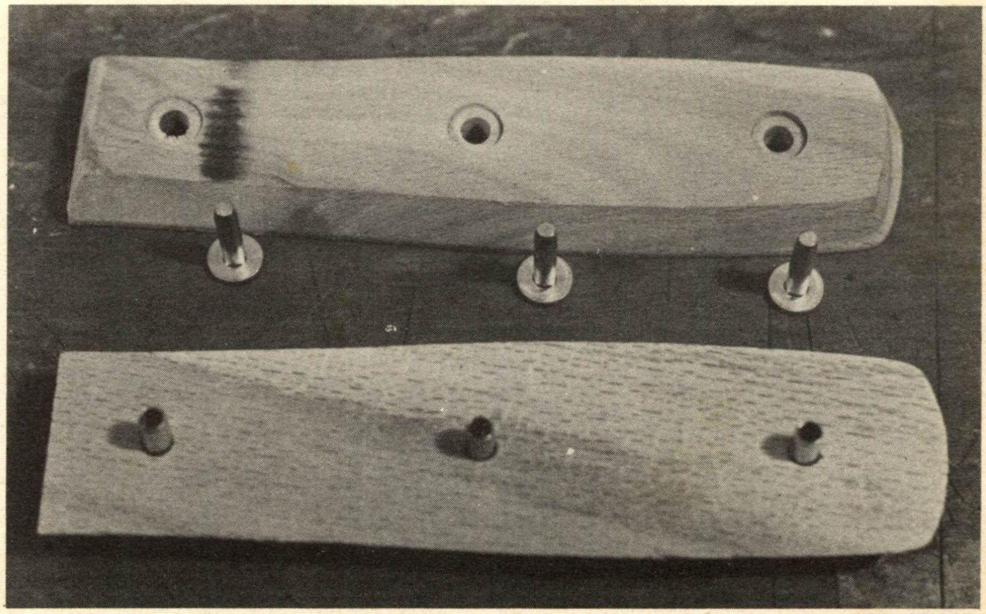
At first glance it looks like a butcher's knife or, as referred to in the South, a hawg knife. That basically is what it is, but with additional features that require an explanation to fully appreciate the knife.

The mountain man, frontiersman, or whatever name you choose, was armed with a single-shot muzzleloading rifle. A few also carried a single-shot handgun as additional protection. If he missed with that single shot or merely wounded, reloading required time. A fast-closing adversary, beast or enemy, often did not allow time for reloading.

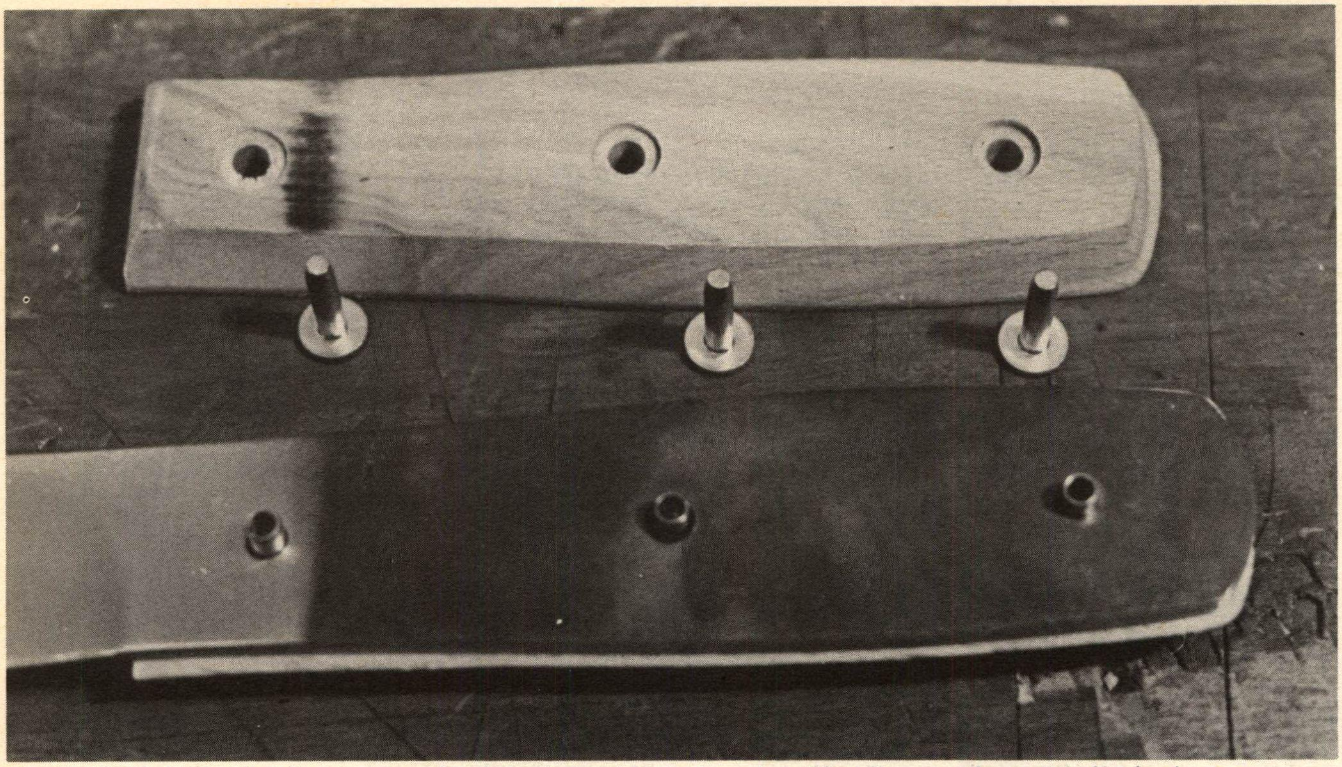
An empty rifle, even in the hands of a well-trained



*Outsides of handles are countersunk to accommodate rivets. Inside of handle is illustrated at bottom.*



*Hollow rivets inserted and protruding through handle.*



*Shank of knife laid on handle, rivets passing through matching holes, edge of handle extending past knife shank.*

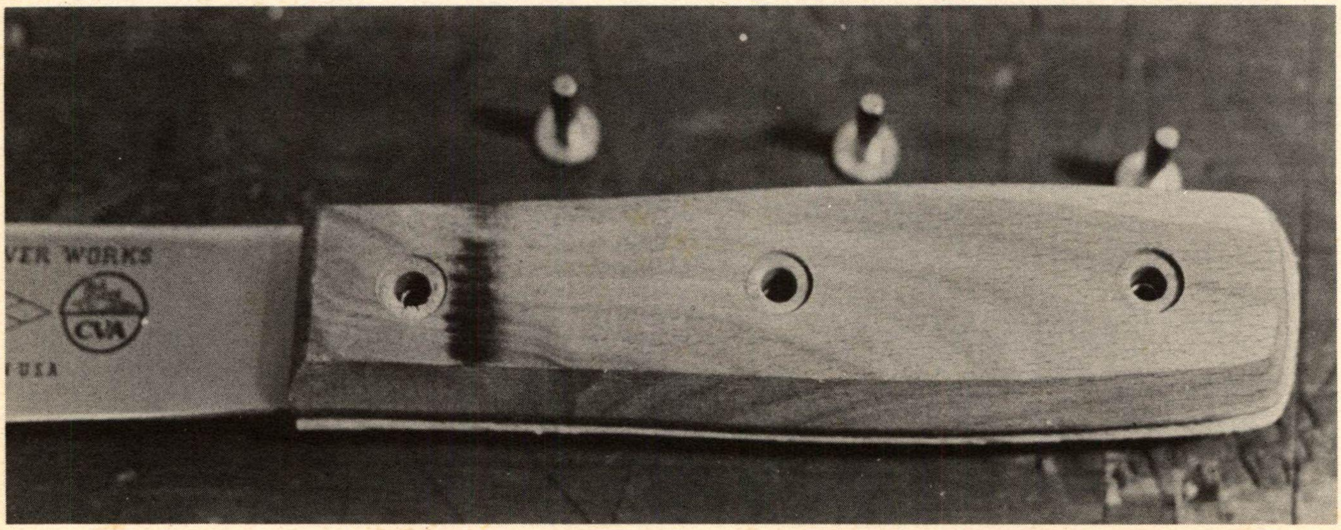
soldier, is nothing more than a club. At toe-to-toe distance it even loses this defense ability. With a good, sturdy, sharp knife of ample length, the entire situation is changed. There are literally thousands of well-documented incidents when a good knife made the difference between life and death. This simple fact was not unknown to the men and women who faced this possibility in yesteryears.

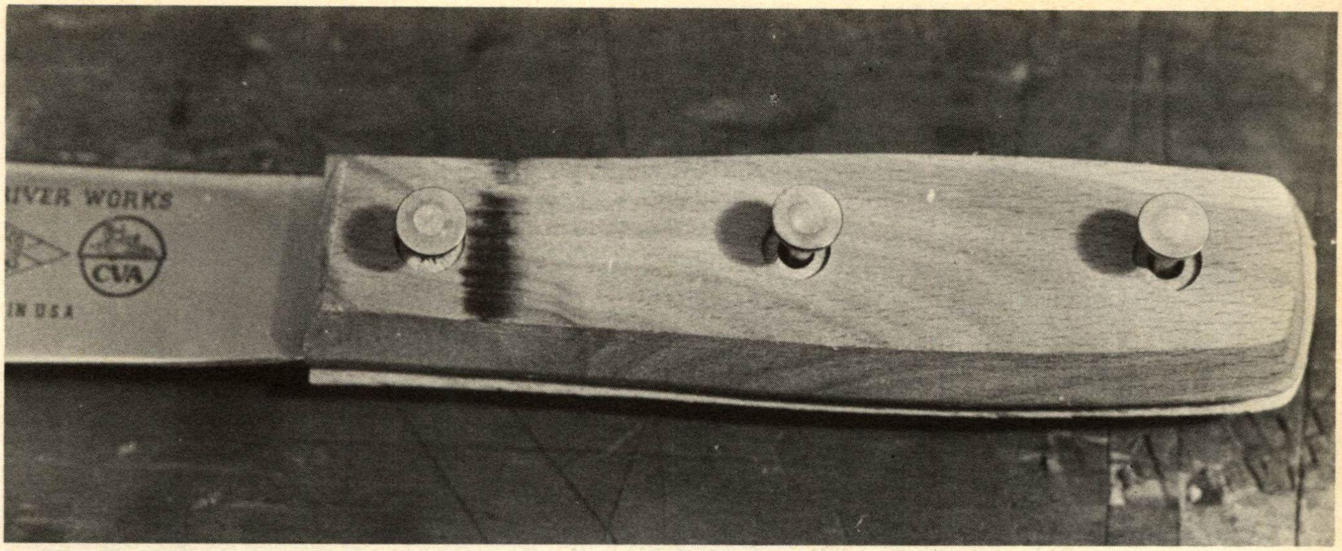
This was, however, only a small, but important, factor of the necessity for a dependable knife. It was the tool that cut brush to form a lean-to for shelter against the elements; it was the tool used for skinning game and cutting it into sections for food; it even cut the wood for the fire to cook the game and then served as an eating utensil; it was the tool that made clothing from the skin of the game. Food, shelter and clothing, then as now, are the necessary basics of human life, and the knife played a major part in providing all three.

An easily broken or dulled cheap knife was not just an inconvenience to the early frontiersman; it was a disaster on long trips away from civilization into the wilderness. Is there any wonder that the frontiersmen were willing to pay top price for a dependable knife?

In 1834, on the banks of the Green River at Turner Falls, Massachusetts, John Russell founded a company to

*Other handle in position, rivets aligned with holes, handle extending over shank. If necessary, reverse handle positions.*






*Solid sections of rivets are inserted and pressed down firmly with thumb to temporarily hold them in place.*

manufacture such a knife. The products of the John Russell Cutlery Company's Green River Works found an eager market. The name of the product was shortened in everyday language to simply Green River knife, and its diamond-shaped trademark soon became well known on the frontier.

The heart of the Connecticut Valley Arms' kit is an authentic blade design of 1834 made from the finest, high-carbon cutlery steel with long-lasting edge-holding quality. The handles, or scales if you prefer the correct term, are top-grade beechwood joined to the tang with heavy-duty five-thirty-seconds-inch brass expansion rivets. The sheath is of the pouch type of the same period design and is made from top-grain, oiled cowhide. A well-written and illustrated instruction booklet completes the kit. To fully appreciate how much hard work has been done on the blade and tang, you would have to grind or forge a blade and tang yourself from stock steel. To the average person it looks simple, but having made a couple dozen knives from scratch, I was surprised at the quality of the blade and tang. The lines are correct and the various tapers in the blade leave nothing to be desired. Even the finished metal surface is devoid of gouges and scratches, and the edge correctly sharpened. No work whatsoever is required on the blade or edge.

The sharp edge requires that extra safety precautions be taken to avoid what could be a nasty and painful injury in completing the kit. Use a piece of thick cardboard, such as the back of a notebook, to make no less than two, full-length wrappings around the blade. Pull tight and wrap the cardboard blade sheath securely with electrician's or other heavy-duty tape.

This does not damage the blade or edge, and is easily removed after the handle components have been completed. You can now hold and handle the blade with relative safety. Even after considerable knife-building experience, I still used heavy-duty, leather welding gloves while building the kit.

To begin, place the two handles and the three rivet sets to one side. Note that the rivets are in two parts: one has a large diameter shank with a hole in the end of the shank, the other section has a smaller, solid shank. Also note that the handles have a countersink for each rivet head on the outside.

Push the larger rivets with the hole in the ends through one of the handles until the rivet heads are well into the countersink recesses. Lay this handle side on your bench with the rivets facing up and protruding through the handle. Now ease the tang of the knife over the rivets until the three holes in the tang are lined up with the protruding rivets. Press the knife tang down firmly against the handle and the rivets will protrude through the knife tang holes.

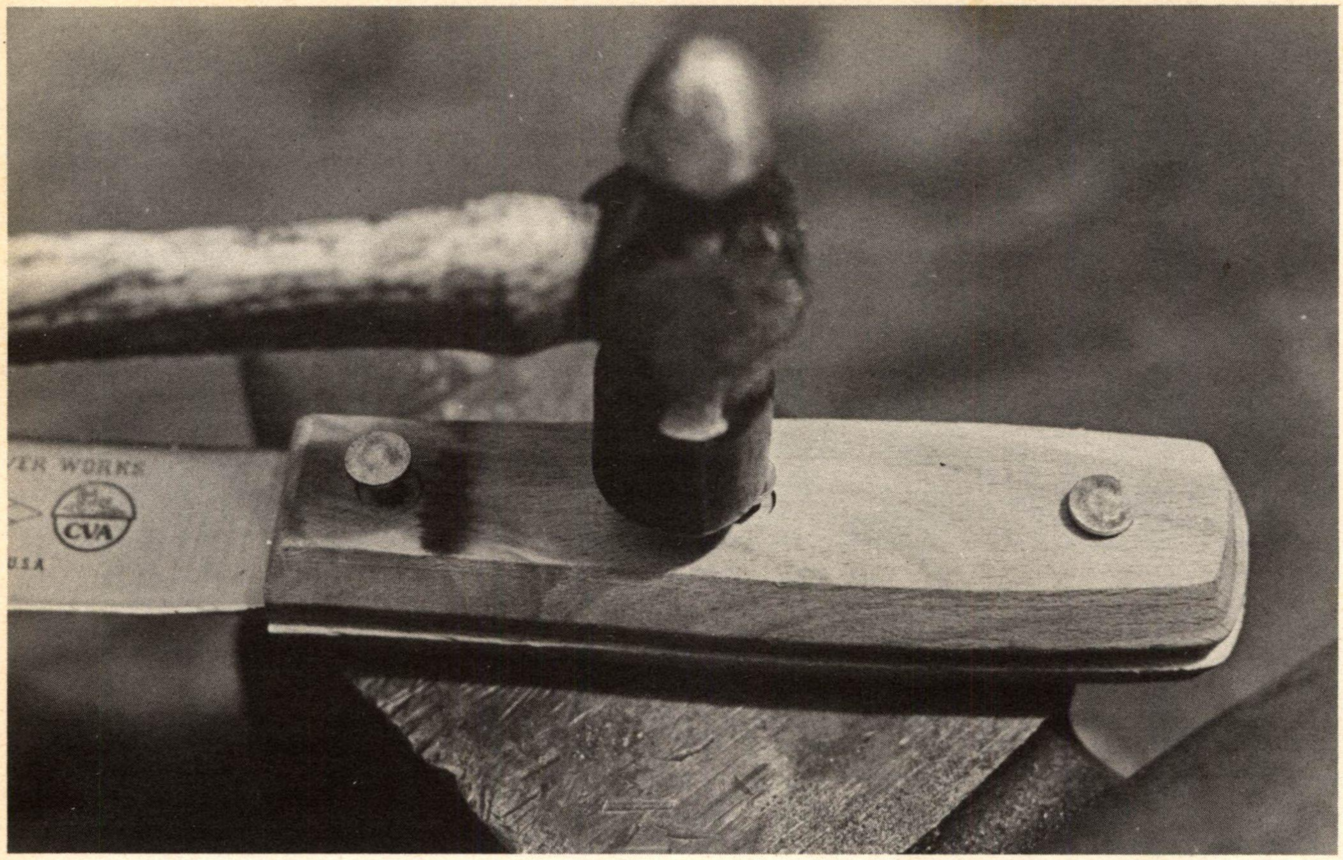
Stop and look to be sure the wood edge is either flush with the sides of the knife tang or extends past the tang edges all the way around the tang. If not, remove the tang, turn it over and recheck the alignment. This was not necessary with the kit I obtained, but it is important that the wood edge of both handles fit flush or extend past the metal tang; otherwise, it becomes necessary to grind the tang in width – a step to be avoided.

The next step is to lay the other handle on top of the knife tang, rivet recesses up. Check for hole alignment. Press the three solid rivets down into the hollow-end rivets hard, with your thumb. All you want is firm pressure to hold them in place temporarily.

Now, transfer the partially assembled handles and knife tang to a smooth, flat metal surface. Tap each of the solid rivet heads lightly with a small hammer, one after the other. Come back to the starting end and repeat the light taps, in sequence. Each tap of the hammer will drive the two-part rivets closer together and close the gap.

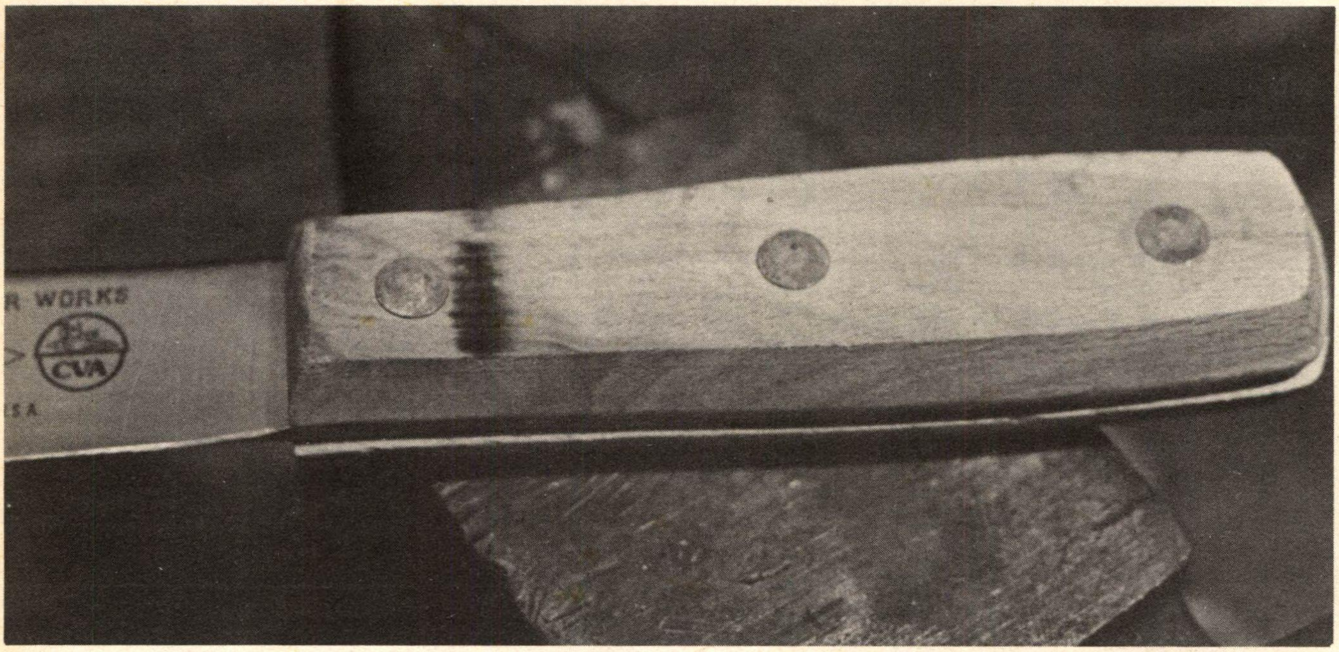
It is a mistake to attempt to fully seat one rivet with one blow: This is as good a place as any to learn an important lesson. Anytime you have two or more screws, rivets, bolts or other fasteners, the correct method is to tighten each a little at a time, and keep repeating the sequence until they are all seated. This assures equal seating and prevents binding, twisting or breaking of the part being assembled.

When all three rivets are fully seated, give each a slightly heavier blow with the hammer. Don't try to see how hard




*Rivets are tapped down in sequence. Note first rivet has not been fully seated to prevent twisting or uneven set.*

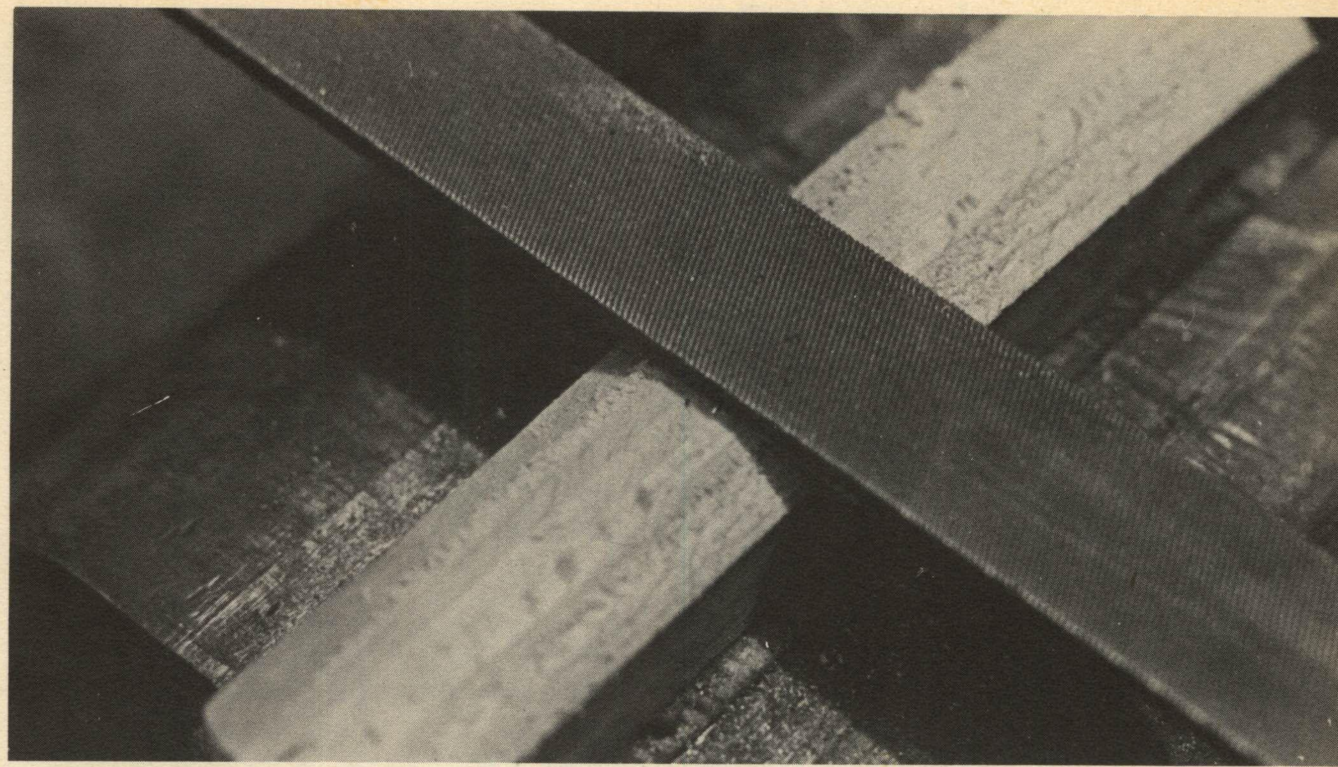
*After rivets are firmly seated, turn handle over and tap each rivet again to ensure seating in respective countersink.*




you can hit a rivet with a hammer, just give it a slightly heavier blow. Now turn the handle over, hold the side you have driven the rivets into down against the flat metal surface and give the rivets on this side the same slightly heavier blow.

Hold the assembled handle edgeways against a strong backlight. There should be no gap visible between either of the handles and the knife tang. If there is light showing through, the rivets are not tight enough.

The next step is to get the wood edges flush with the knife tang edges. Secure the handle in a vise, place a metal file crossways the length of the handle and draw-file until



*Single-cut file held crossways to handle is used for shaping. Wood rasp should not be used for this purpose.*

*Sandpaper wrapped around wood block is used to smooth up the wood handle. Note the close fit of wood to metal.*


*Finished knife with the tools required for assembly: hammer, file and sandpaper. Knife handle has not been stained, however.*

wood and metal are flush. Turn the handle over and repeat on the other side. Next file the butt end flush.

Wrap some medium grit sandpaper around a wooden block and sand each edge smooth. Lightly bevel each of the wood edges with the sanding block. Now secure the handle in a vise with the handle flat and rivets up. Switch back to your file and draw-file the handle until rivet heads and wood are flush. Unlock the vise, turn the other handle up, secure the vise and repeat on this handle flat.

Back to the sandpaper and block of wood backing to smooth up each side of the handle and the brass rivets. The handle is now well shaped, but will have a sharp corner where the edge and flat side joins. Round this sharp edge with your sanding block. Finally, switch to a fine grit piece of sandpaper and go over the handle again. Remember to sand with the grain of the wood, not against the grain, or scratches will show. A brisk rubdown of the wood with four aught –0000 – steel wool will burnish the wood to a nice, natural sheen. The knife is assembled and the cardboard protective sheath can now be removed.

The pouch-type sheath dates from the same period of time as the knife design. Like all items used on the frontier, practical application and rugged dependability were the primary considerations. At first glance the pouch sheath appears to be a poor method of carrying a knife. Actually, it provides maximum protection and the only way you can lose the knife is if your belt breaks.

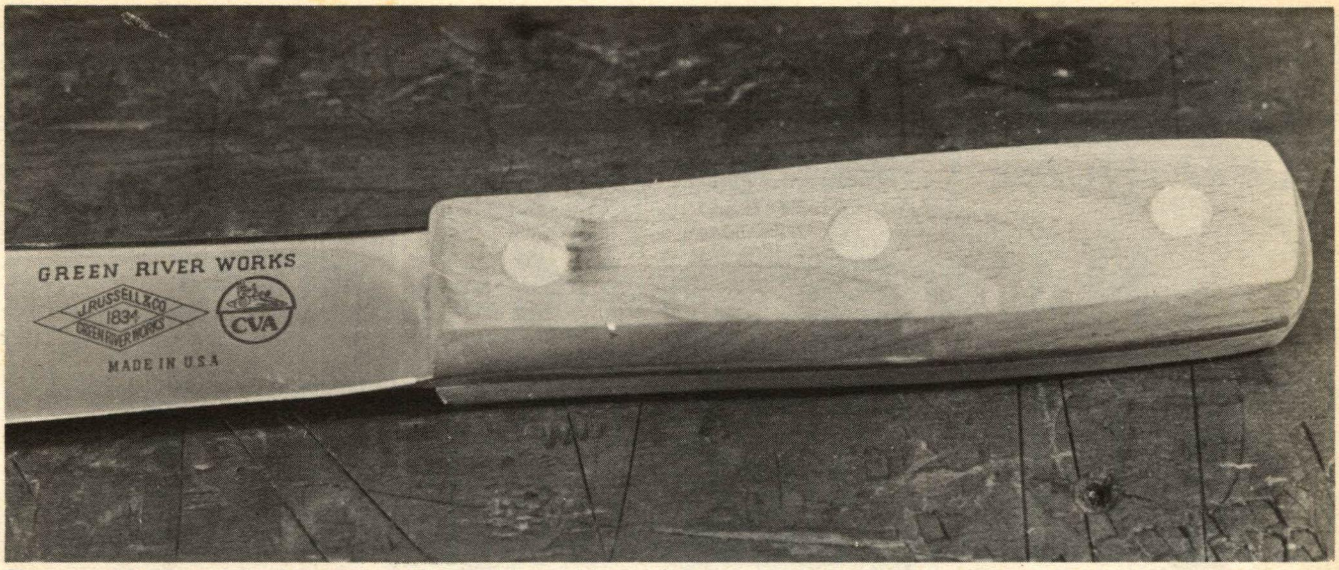
In use, the belt goes around the outside of the sheath, the knife inside it, and then through the belt slot of the sheath. In this way the knife and sheath are held firmly against your side providing excellent holding ability of the knife in the sheath, yet is readily available at all times. The six brass rivets prevent the knife edge from cutting through the leather sheath – but without damage to the edge itself, as would be the case with steel rivets. The laced edge closes the pouch sheath.

To assemble the sheath, first fold it in half lengthwise with the rough side of the leather inside the fold. Line up the rivet holes and, with the leather resting on your bench top, press down hard on the fold. Run the palm of your hand up and down the fold to create a temporary crease.

Now closely examine the two-part rivets. One section has a stud with a hole in its end. The other section is like a cap. If you examine the underneath part of the cap you will notice a small, square pyramid in the center and a recess under the edge of the rim. As the square pyramid point enters the hole in the end of the other section of the rivet, it expands the hole until it is forced out into the recess in the cap rim and is locked in place. With the rivet holes lined up insert the hollow-stem section of one rivet from the bottom, allowing it to protrude through both sections of leather. Lay the head of the rivet on a smooth piece of metal. Now place the cap on the rivet, pyramid entering the rivet hole, and hold it straight. With your hammer give the rivet cap a quick blow. The hollow end of the rivet will expand and lock under the cap rivet rim. Give it another blow or two with the hammer until the leather starts to compress, then turn the sheath over and check to be sure the other rivet head has also compressed the leather lightly. If not, a light tap with the hammer is all that is required.

You can start at either end of the sheath when installing the rivets, but the end next to the belt slot is easiest and will allow you to get the feel of seating the rivets. Work your way to the other end, one rivet at a time, until all six are fully seated. Due to the type of rivet used, you have to break the rule previously stated and seat each rivet fully before proceeding to the next rivet.

The leather lacing thong will appear too short, but it is



*Close-up of knife handle after final sanding and burnishing with steel wool. Everything's flush, handle nicely rounded.*

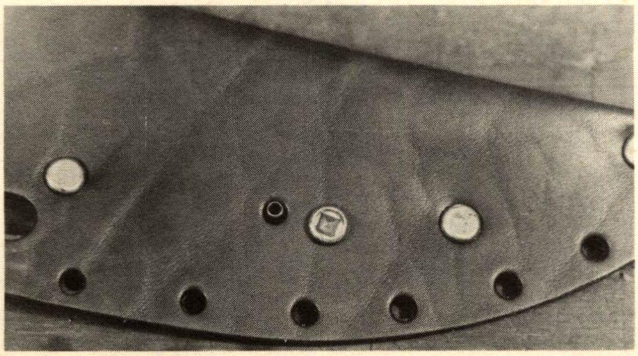
oiled and will stretch. Pull it hard several times to stretch it before lacing. Begin by tying a knot in one end and pull tight to eliminate excessive overhang.

Note the accompanying photograph. The lacing is shown loose for illustrating the simple loop-type lacing method. When doing the actual lacing, pull hard on the lacing thong, and I do mean hard. Don't worry, you will not break it or tear the hole in the sheath. When you reach the top hole, tie another knot in the leather lacing thong. If the end is too short, you simply have not pulled the lacing tight enough. Unlace, stretch the thong and pull the lacing tighter on the next try. If you pull hard enough you will have an end long enough for the knot with almost a full inch to spare.

When finished assembling the sheath, insert two fingers into the sheath top and expand it slightly. Now carefully push the knife into the sheath, cutting edge toward the brass sheath rivets. As the sheath leather is oiled, it will slowly form itself around the blade and handle for a perfect fit. The kit is not fully assembled. You can use it this way or add personal touches if desired.

The blade is best left in its present shape and not

*Beginning assembly of sheath. Leather has been folded and all but one rivet installed. Small pyramid square in the center of rivet cap expands hollow rivet-end for locking.*



changed by grinding. It can be kept bright with a light oiling or allowed to age naturally. You can also artificially age the blade if desired.

As the blade probably will be used to cut food, bluing or browning chemicals should not be used to artificially age the blade. Common household foods will do the job. Coat the blade with the juice of a lemon and allow it to set overnight. A sprinkling of table salt will add off-shade flecks of color. Wash clean and next coat with tomato juice and dabs of mayonnaise for the second night. Wash the blade and you will have a mottled color patina that makes the blade look several years old.

The handles can be reshaped, such as filing and sanding in finger grooves. You can even checker the handle flats, if desired. Small, odd or round-headed brass tacks can be added, but first drill a tiny hole for each tack to avoid splitting the wood. A light coat of Connecticut Valley Arms' stain can be applied if you want a darker shade to the wood. Follow up with a couple coats of Connecticut Valley Arms' Number 2 stock finish for a nice sheen.

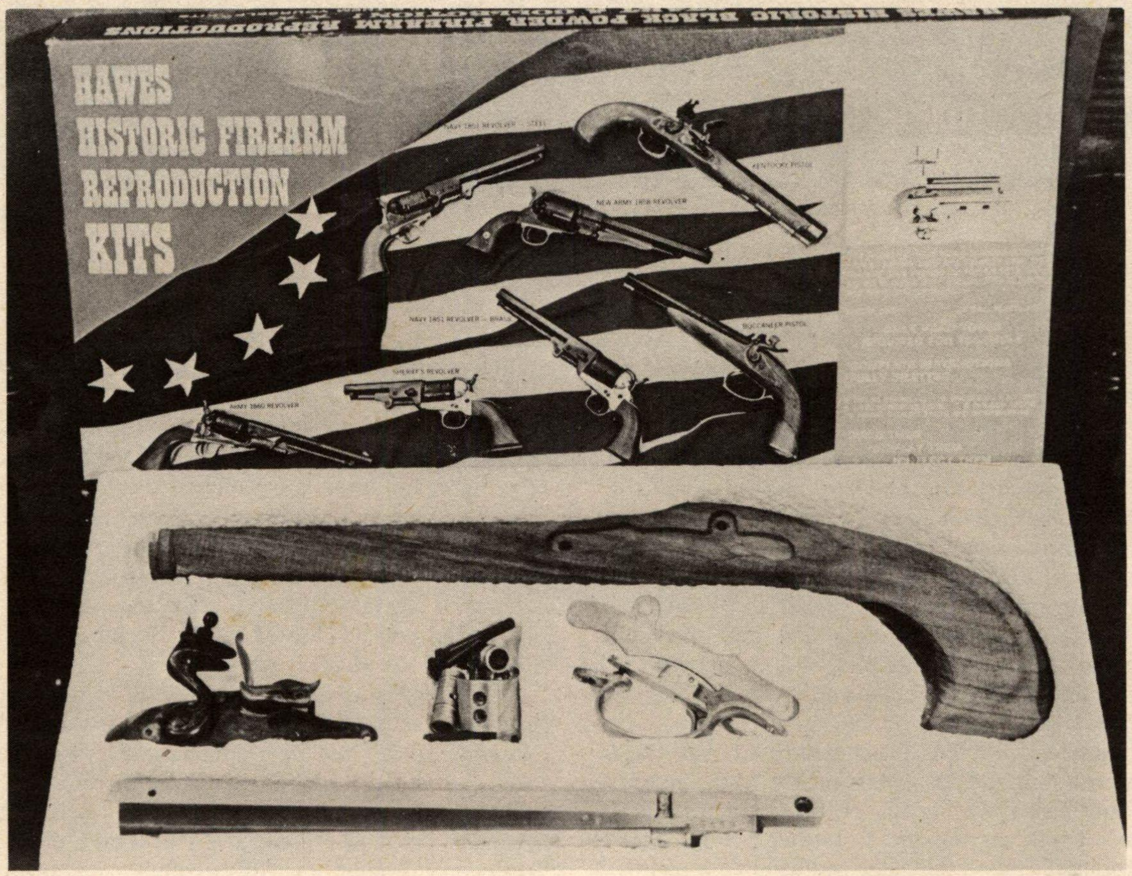
Handles can be made easily from other woods, usually available as scrap from cabinet shops. The only thing to remember is that the wood should be hard and tough. If you have a large piece of staghorn or bone, this will make unusual handles. If the brass rivets provided will not work with your special handles, use five-thirty-seconds-inch diameter brazing rods, cut to length, bradded on each end to form the rivet pins.

If you like fringe, sandwich a piece of suede leather between the lacing holes. Punch matching holes, lace as usual. Now cut the piece of suede edge left protruding into fringe strips.

Your first project will be fun to assemble, and you will have a practical and useful hunting knife for years to come. Simple as it may seem, assembling the kit will make you feel more comfortable with tools and better skilled to move on to the next, more complicated project. It is a well-established fact in any form of instruction that success breeds confidence.

CHAPTER 7

# HAWES' .44 CALIBER




# KENTUCKY PISTOL KIT

## Here's A First Firearm Project That Requires A Minimum Of Tools

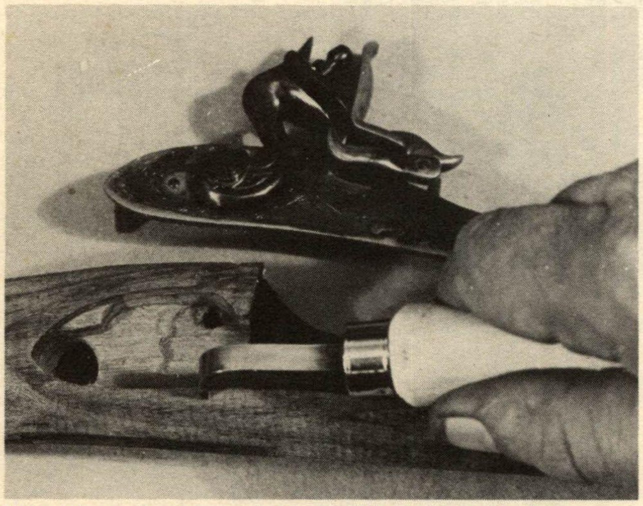
THE FIRST GUN KIT to be assembled should be carefully chosen for several reasons: it should require a minimum of tools; be ninety percent finished in difficult areas, yet enough latitude allowed to instruct by practical application; and of equal importance, the end result should be a quality product that can be enjoyed.

I personally feel that the first gun kit should be chosen for simplicity of construction and assembly. Any revolver, no matter how complete, is too large a step because complicated items, such as action timing, can be out of sequence in the best of kits. A single-shot with a side lock is a much better choice.

The Hawes .44 caliber Kentucky pistol kit meets all of these requirements, and is available in percussion or flintlock. I chose the flintlock version as the vent hole can be slightly off center without causing ignition problems.

The percussion hammer requires much closer alignment between the nipple and cap for perfect ignition. Furthermore, the flintlock version is more historically correct. Shooting a flintlock is a lot of fun, and unfortunately, a large number of black powder shooters never take the time to enjoy these guns.

The original Kentucky pistols were introduced as simply a short version of the more abundant Kentucky rifle. The early frontiersman probably could not pronounce the word logic, but every piece of his equipment was an example of practical logic learned in the school of hard knocks. His pistol was no exception.



*Using flat end of a wood scraper, minor imperfections are cleaned up in the lock recess area of the stock.*

Two rifles would have been more useful, but since the frontiersman already was loaded down with the necessities to sustain life, weight was the deciding factor. A pistol was simply the more reasonable solution. Many were smooth bored, but a larger number were rifled; both versions usually were made to accept the same size ball as the rifle, thus eliminating an extra bullet mold.

Many historical writers seem to ignore one obvious fact: The frontiersman had to be a good shot and thoroughly familiar with what his firearms could and could not do in varying circumstances and ranges. If he did not, he had a very short career.

The rifle reigned supreme, the pistol being carried for survival when challenged by man or beast. Like the knife, it also served for other purposes. Loaded with a small powder charge of shot, the rifled or smooth bored version was ideal for such small game as rabbit and squirrel at close range. If disaster struck and the rifle became inoperative, range may have been decreased but not the ability to place a heavy, charged ball in the right spot.

The horse was the means of transportation from one settlement to another, and a full-length Kentucky or Pennsylvania rifle had to be carried by hand; and at full gallop, it definitely was not the ideal selection for protection. A brace (two) of pistols carried in saddle holsters across the front of the saddle, one on each side within easy reach, was a much more practical solution.

As an interesting side note, the single-shot pistol usually is more accurate and more powerful than a similar revolver in the same caliber, same bore diameter and same powder charge. Unlike the revolver, there is no gap between chamber and bore allowing gas to escape, nor is there the problem of accurate chamber alignment with the rifled bore.

The first step in assembling any kit is to read the instructions. Not once, but several times until you are thoroughly familiar with each step in the construction. Equally important is to carefully study the parts diagram until you know the name, the location and purpose of each part and component. Probably the greatest mistake made by gunsmiths, beginner or professional, is to read the instructions only when all else fails.

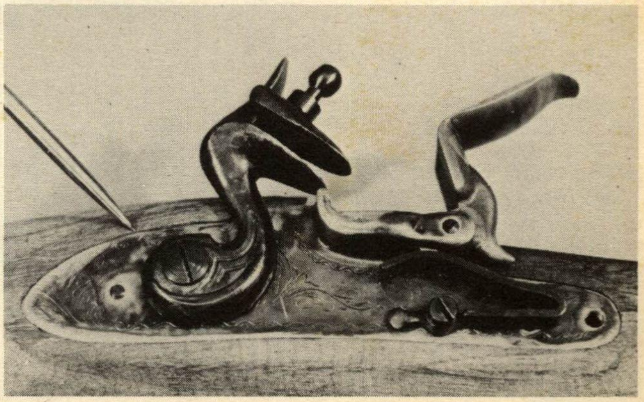
I may deviate from the manufacturer's instructions – I am more familiar with a different sequence from past experience – but I still read the instructions, without exception. Why? Because there may be a small exception that, if ignored, could result in a major problem. Another reason is that you never stop learning in any profession, and the instructions may contain a simpler or better method.

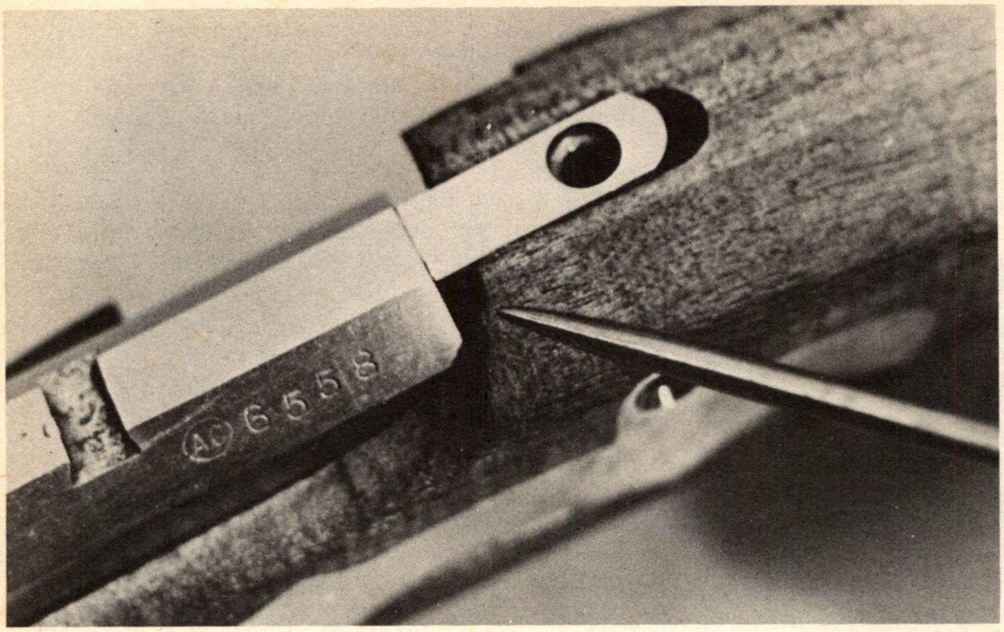
The proper alignment of the lock and the barrel in the stock takes precedence over all other components. Keep this in mind, as the other parts and components usually can be adjusted to conform to this all-important alignment. If you have to choose between lock and barrel in a ninety percent inletted stock, choose the lock as its pre-cut recess leaves little room for realignment. The barrel recess normally will require some wood removal, therefore minor adjustment is possible to achieve alignment with the lock.

The first component to be assembled to the stock is the lock, however, before the first try to see if it will enter its recess, examine the recess closely. If there are any slivers of wood left over from the factory machining operation, they must be removed or smoothed over to avoid jamming the lock mechanism. The best tool for this purpose is a one-quarter-inch wide square-end scraper. Do not remove any wood, just smooth up the surface. Do not remove any wood from the sides of the recess, even if it is roughly inletted.

Cock the lock. With your thumb, securely trip the sear bar and ease the hammer fully forward past the safety notch. The hammer must be in the full forward position. This allows the hammer mainspring to be at full

*Pointer indicates close fit of the lock when assembled to the stock. Note hammer is in full forward position.*





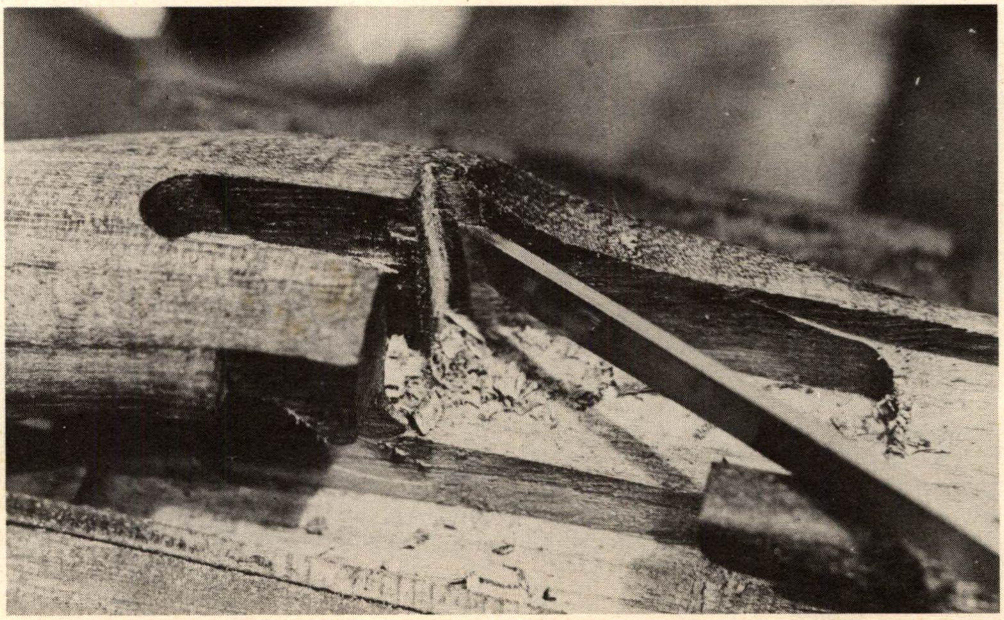

*In initial effort to assemble barrel, author found factory machining incorrect. It did not allow barrel, plug/tang to go fully to the rear to align with tang screw hole.*

decompression as it would be if the gun was fired. This is to make sure it will not be stopped by any excess wood in its function. Also, the sear bar is not under normal cocked tension, and will allow the lock to enter the recess even if additional wood has to be removed later to give it room to function.

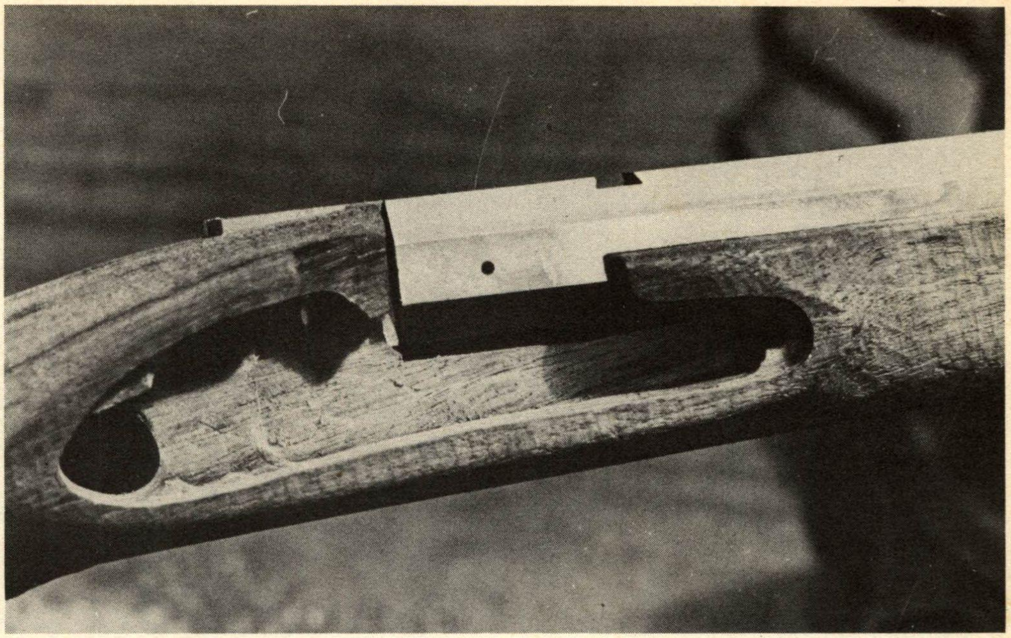
Hold the lock level with its recess – if you tip one end or edge down, you will get a false impression. With the lock resting on its inletted recess, closely examine all edges of the lock where it touches the wood. With this kit, the inletted lock recess was very close. Next, apply thumb pressure exactly in the center of the lock. If the inletting is good, the lock will easily press into place. Do not hit the lock with anything as you will split the wood or damage the inletting. You want as close a fit of wood to metal as possible without any gaps.

With this specific kit the lock would not fully seat. If you should experience this problem, remove the lock. The pressure from your thumb will show where the stock is not fitting as the wood will be compressed. Very carefully and very slowly use a flat-end scraper to remove a wee bit of wood at this point only. The wood removed would be just dust! Go slowly. A common mistake is to remove too much wood, and this kit was a perfect example. It required only one light pass with the scraper and, on the next try, the lock pressed into place absolutely perfectly. It is so close that it would be hard to distinguish where metal stopped and wood began.

With any kit, it always is a good idea to try turning the screws into their threaded holes before you begin assembling the components. There is a simple reason for this precaution. If you look at the threads of a screw under high magnification, usually you will see very tiny burrs and slivers of metal. The same is true with the threaded screw hole. Turning the screw in and out of the screw hole several times burnishes the threads of both and makes



*Using a sharp, wood chisel's flat end, hand pressure, small bits of wood are removed. Cut is at 90-degree angle at the rear to match the rear of the barrel.*



*Inletting is almost complete, but a bit more removal of wood is required in trial method to assure proper wood, metal fit.*

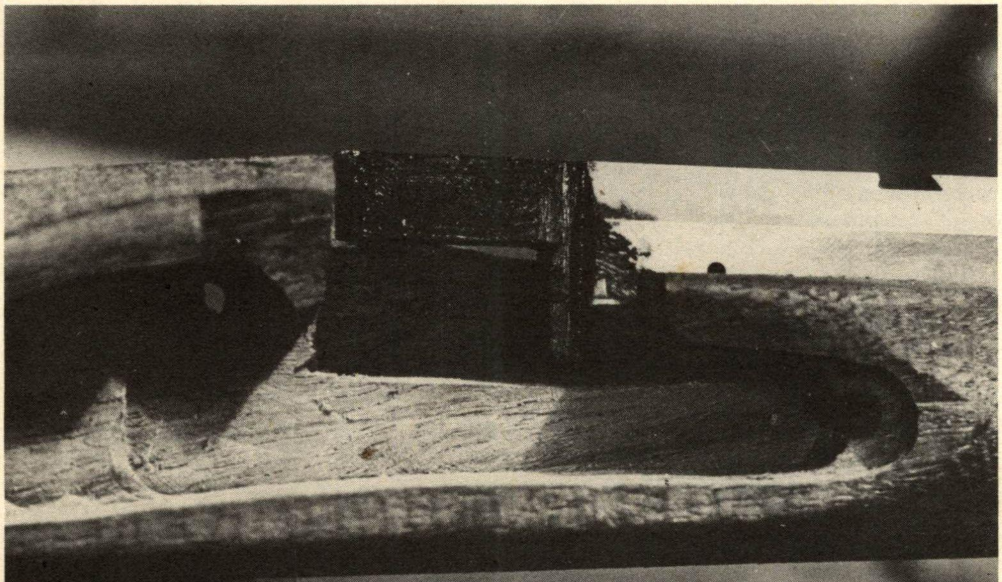
them mate more evenly without binding. Excess grease should be removed and only a very light oil used for this working-in step.

With the lock in place, try fitting the side plate on the opposite side into its inletted recess. If it fits in with only thumb pressure like the lock did, fine! If it does not, slip the side plate screws through the side plate and try to get them started into the lock plate; however, do not pull them up tightly in an attempt to force the side plate into its inletted recess.

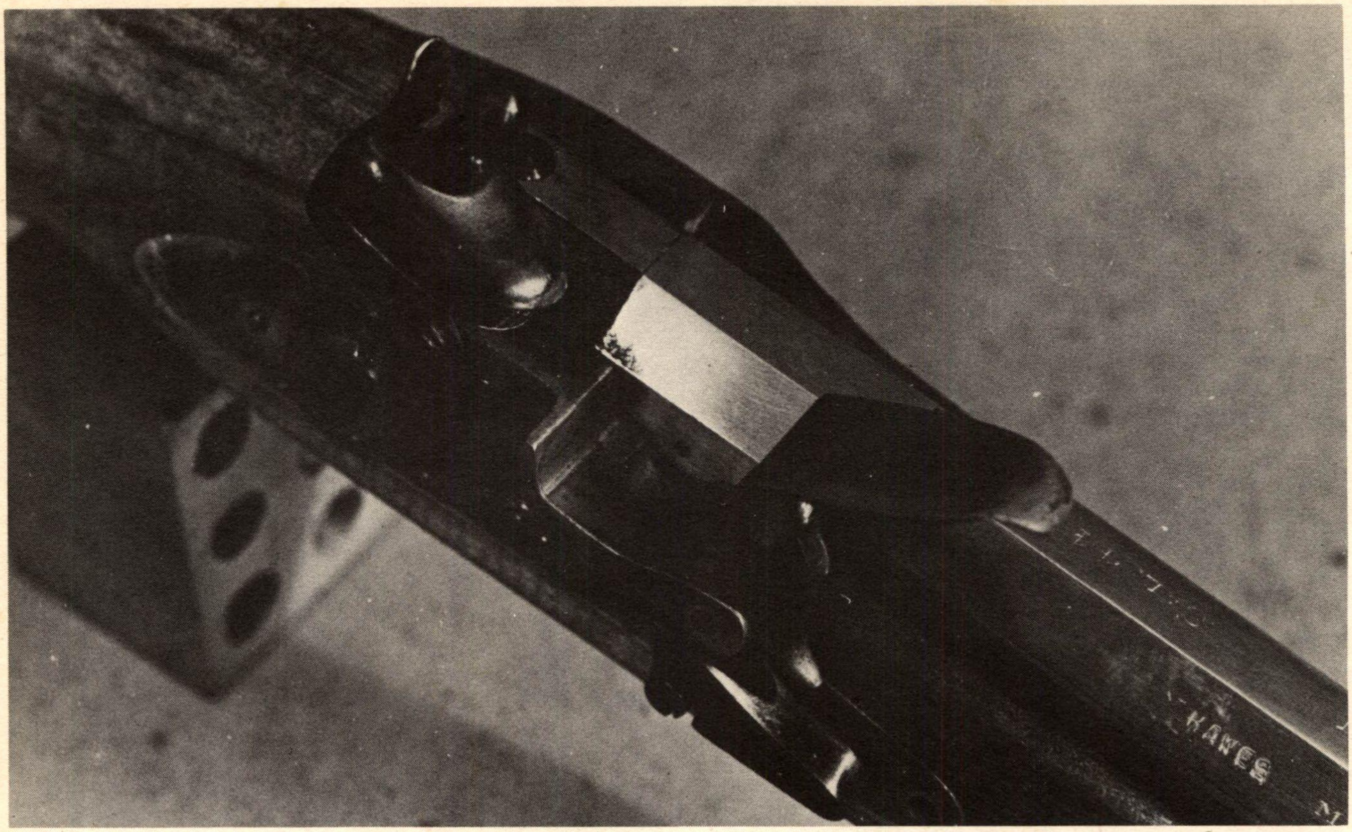
The reason for trying the side plate screws is to see which end of the side plate is not lined up with the screw holes, the front or the rear. Obviously, if you have to remove some wood to fit the side plate, you want to remove it from the end that will allow the side plate to enter its inletted recess with correct screw hole alignment.

If the side plate fits into its inletted recess with only thumb pressure, as this specific kit did, insert the side plate screws. With this kit the two screws lined up perfectly with the lock on the opposite side, although sometimes a screw hole will not line up. In these cases, look closely to see where the wood is out of line, remove the lock plate and side plate, and then, using a round needle file, remove the wood that is preventing alignment. Remove only a small amount of wood, reinstall the lock and side plate for another trial. Go slowly, and remove only the minimum amount of wood necessary for alignment.

In this type of gun, the breech plug and tang are made as one piece, screwed into the rear of the rear end of the barrel. The tang is flat and lined up with the top flat of the barrel. Before attempting to install the barrel in the stock, examine the breech plug, tang and rear of the barrel. Look for burrs and rough machining that may interfere with a good wood-to-metal fit. If there are any, a few light, file strokes followed by a strip of aluminum oxide cloth wrapped around the file for polishing will smooth the



*Inletting black is used on the tang/breech plug for the final fitting to mark proper position.*




*Barrel in position with the tang screw and lock installed, the barrel touch hole and powder recess in the pan now are centered correctly. Also note that the lock and the barrel now are fitted snugly together without any gap.*

section. Be sure you do not change any angles, just smooth up any rough sections.

Remove the lock, side plate and screws. The barrel channel is very closely inletted, and at this point these components will only be in the way. Note the inletting for the tang and the pre-drilled tang screw hole.

Lay the barrel into the barrel channel and slide the barrel straight back until it stops. Note the position of the tang hole in relation to the tang screw hole in the stock. At the same time, without changing position of the barrel and stock, check to see if the back of the barrel butts up flush with the stock. With this specific kit, the left side of the stock was not inletted enough to allow the barrel to butt against the stock, or the tang hole to align with the tang screw hole.

Clean the tang and breech plug. Use a small dab of inletting black and spread it over the bottom of the tang, breech plug and rear end of the barrel. Only a very small amount of inletting black is necessary, as it spreads easily. Too much will give a false reading and get all over the wood.

Now, slide the barrel in its channel straight back until it stops. Lightly tap the muzzle, then slide the barrel straight forward and out of the stock. Do not lift the barrel up and out of the stock.

Look at the stock. Where the metal touched, it left some of the inletting black at the exact location. Select a sharp, flat-end wooden chisel and, with the stock secured in a vise, first make an end cut crossways of the stock and then a lengthwise cut parallel of the stock. Remove only a small amount of wood. The secret to correct use of wood chisels is light cuts with hand pressure only. Wood is easy to remove and if you remove too much you will have to glue it back. Go slowly.

Next, again use a cotton swab to spread the inletting black over the metal surfaces, and keep spreading it each time some is left on the wood. There is no need to add more as it works best in a thin coating.

Try fitting the barrel back in the stock again, following the procedure of marking the wood where it is preventing the metal from fully seating. Check the hole alignment and, if more wood removal is necessary, cut away a small amount and try the barrel again.

Keep repeating this marking and cutting, checking alignment each time. When the tang hole and tang screw hole are about halfway aligned, place the lock back into its inletted recess. Now, carefully check the touch hole in the barrel with the dished-out powder recess in the lock pan. If the touch hole is now forward of center, you simply have to finish inletting the barrel back more for the tang and tang hole in the stock to align.

If the touch hole is centered or slightly to the front you have a problem; although this situation is rare on a good quality kit. You can obtain another stock or repair the stock. One method of repair is to glue a plug in the tang screw hole, then drill a new and correctly aligned hole. Another method is to file the hole oversize for alignment and use glass bedding, such as Brownell's Acra-glass, to fill the excess hole space. This was not necessary with the Hawes kit, as the stock hole and tang hole lined up

perfectly after inletting the barrel fully back. The barrel touch hole and lock pan recess lined up perfectly.

The key point is that lock and barrel alignment must take first precedent with any kit for the gun to function correctly. Even such drastic steps as plugging the tang screw hole must be done, if necessary, to achieve correct lock and barrel alignment.

Check the fit of the tang screw in the threaded brass trigger assembly. It should enter easily. Reinstall the lock, hammer fully down, the side plate and side plate screws, but leave them slightly loose. Place the barrel in position and push the tang screw through the tang hole in both tang and stock.

Turn the gun over, belly up, and see if the trigger assembly will fit into its inletted recess, especially if it lines up with the tang screw correctly. If it presses into its inletted recess with only thumb pressure, fine. You are ready for the next step in assembly.

On the sample Hawes' kit the inletted recess in the stock was correct; however, the brass casting of the trigger assembly housing was just the way it came out of the mold – very rough. Upon removing the trigger pin and trigger, the trigger assembly housing was found to be a poor fit and way oversized for the inletted recess. This happens occasionally with any brand kit.

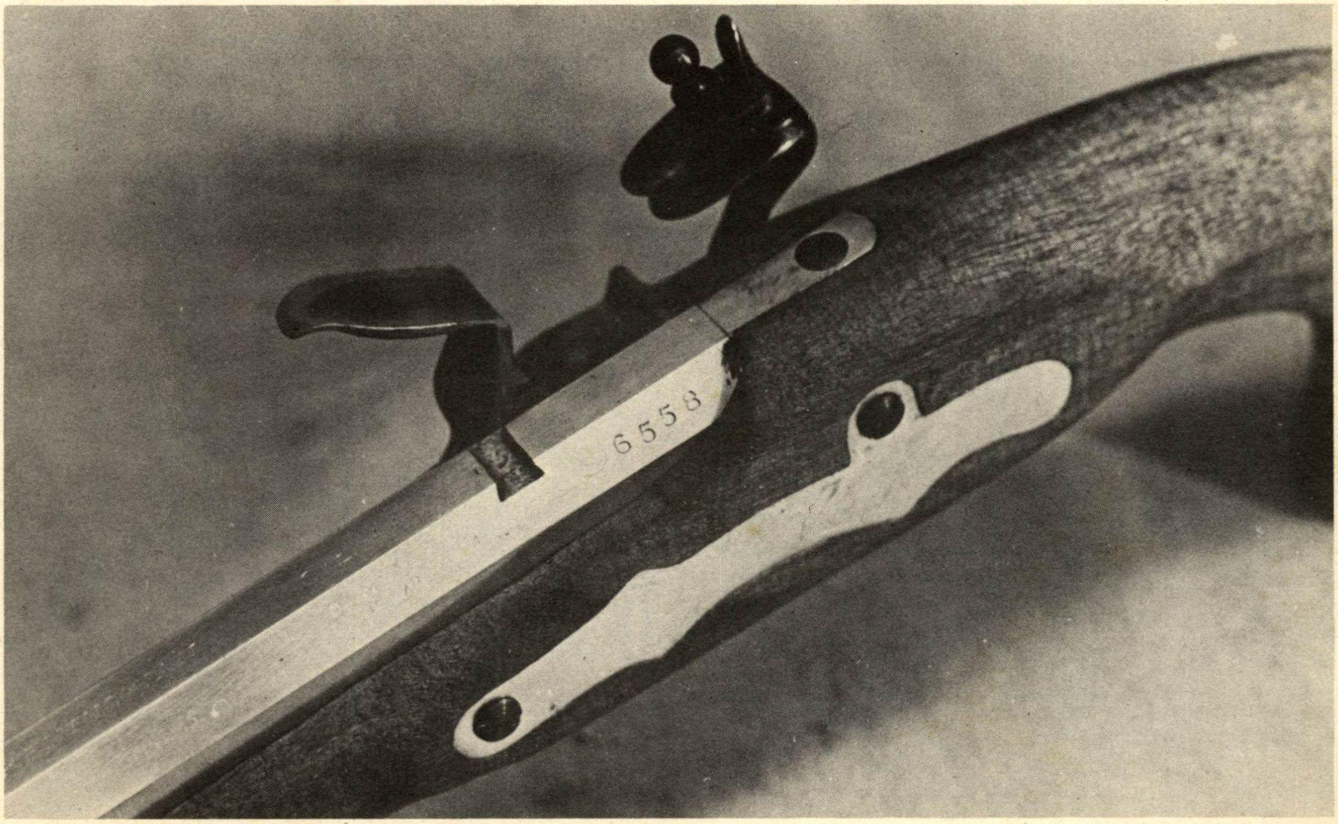
To attempt inletting the wood in such cases is a mistake, especially if the inletted recess is clean and correctly aligned. The obvious solution is to file the unfinished metal to shape, but this must be done with care, removing only a small amount of metal at a time. Repeated tests to see how close you are to mating metal to wood will avoid sloppy fitting. If you wish, cut a cardboard template of the outline of the inletted recess as a guide.

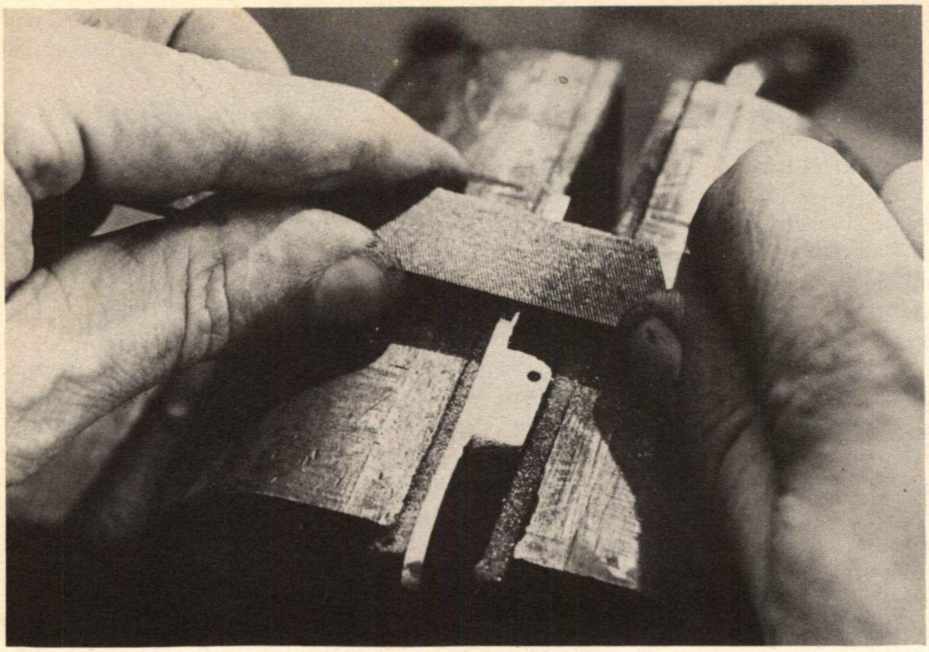
Secure the trigger assembly housing in a vise and draw file each side a small amount. Angle the file slightly so that you taper the metal, with the thinner section on the end that will enter the stock. This way, the trigger assembly housing will start to enter, be stopped, and allow you to slowly decrease the thickness of the wide section for a tight fit.

In addition to the sides, watch the ends and taper them also. Be especially careful to check the alignment of the threaded screw hole in the trigger assembly housing with the tang screw. In my case it was necessary to remove more metal on the front end to achieve alignment. Slow draw-filing and repeated checking are the keys to obtaining a good fit. About one-sixteenth inch of metal was removed from the sides before the Hawes trigger assembly housing fit its inletted recess perfectly. Now reinstall the trigger and trigger pin, and turn the tang screw to pull the trigger assembly up tight.

The three major components now are fitted to the stock, and it is time to do some close inspection to assure proper gun function. Pull the side plate screws up tight, push the frizzen forward out of the way, and look closely to see that the side of the barrel is snug against the lock pan. Remember that when fired the hammer comes forward, its flint strikes the frizzen – creating sparks – and pushes the frizzen forward until the lock pan is exposed and the powder priming charge is ignited by the sparks. The flash of

*In this view of the opposite side, the side plate has been fitted correctly, the action checked for correct lock function sans the trigger assembly. To do this, the lock is tripped with screwdriver, checking movement.*





*Brass trigger assembly housing is secured in a vise, then it is draw filed as explained in text. For this procedure, the trigger and the trigger pin are removed.*

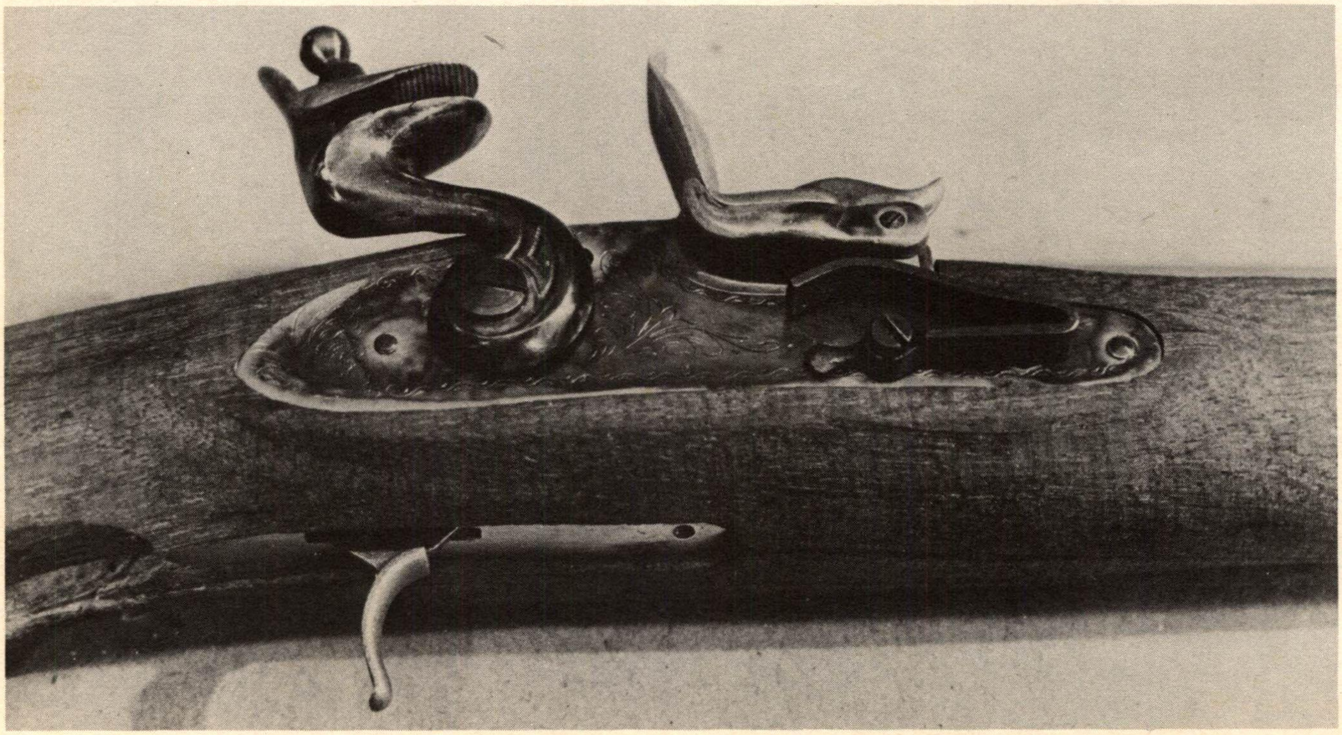
ignited powder passes through the touch hole to ignite the main powder charge in the barrel and fire the gun.

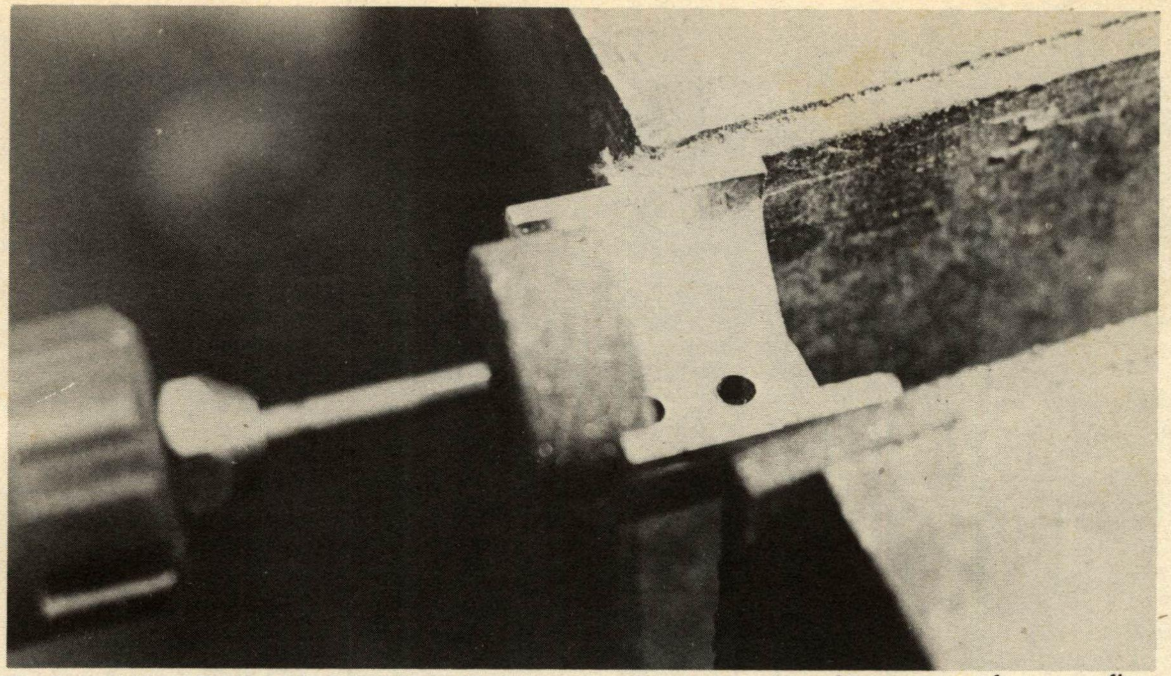
It is obvious that the touch hole must be snugly fitted to the lock pan to assure good ignition of the main powder charge. Also, that any gap at this point will allow the primer flash to get down to the wood and char the stock. With a bad gap, part of the primer charge can work its way past the gap.

With this kit the fit was perfect. If not, it would have been necessary to slowly inlet the lock deeper using wood scrapers and stock chisels. Do not overlook this necessary tight fit!

The next step is to remove the trigger component to check the lock action. The lock sear bar is visible in the trigger component recess. With the hammer fully forward, look closely to see if the sear bar is hitting wood. It should be free and clear. Next, pull the hammer back to the safety notch and look closely again to be sure the sear bar is free.

*Trigger assembly components have been reassembled and the assembly fitted into the pre-inletted recess. The tang screw then must be pulled up tight, author says, so that gunsmith is able to check fit of trigger blade with sear bar.*





*The Dremel Moto-Tool, equipped with small grindstone, removes excess brass from nose cap for proper fit.*

Now back to the full cock notch and check again. If at any point the sear bar is not clear and free, remove a small amount of wood at the binding point until it is free.

Use a screwdriver to trip the sear bar, but ease the hammer forward. Do not snap the lock. Repeat this several times. Now remove the lock and look closely at the lock mechanism inletted recess. The lock plate rests on a ledge to hold the lock in position, but no part of the wood should touch the operating parts of the lock. If you see any place where the operating of the lock has compressed the wood, use your wood scraper to remove a small amount of wood at that point to free the lock mechanism of any wood contact. Reinstall the lock and check again.

Reinstall the trigger assembly, but do not pull the tang screw up tight. With the hammer fully forward, the trigger will be sloppy and loose, so tighten the tang screw until all loose motion of the trigger is eliminated. When assured there is no loose motion, cock the hammer, pull the trigger and note how much pressure is necessary to trip the sear. Remember to ease the hammer forward and not allow it to snap. Try to tighten the tang screw; it should not tighten any more. If it does, the trigger is compressing the sear bar and will not allow the hammer sear and sear notch to fully engage, thus creating a safety problem.

If this occurs, remove the trigger assembly and file a wee bit of the brass directly under the rear of the trigger blade. This allows the trigger blade bottom to go farther down and, obviously, lowers the top of the blade. This in turn will decrease the amount of contact with the sear bar when the trigger assembly is reinstalled. It is a matter of cut and try, cut and try until there is no trigger play, the tang screw is up tight, and full sear and sear notch engagement is achieved.

If the reverse is true – there is trigger play with tang screw pulled up tight – then the trigger assembly should be inletted deeper into the stock. Remove only a small amount of wood and try again. It is the same old story of cut and try until a correct fit is achieved. Slow and careful work are the marks of a craftsman. Go too fast and you will create more problems than you solve.

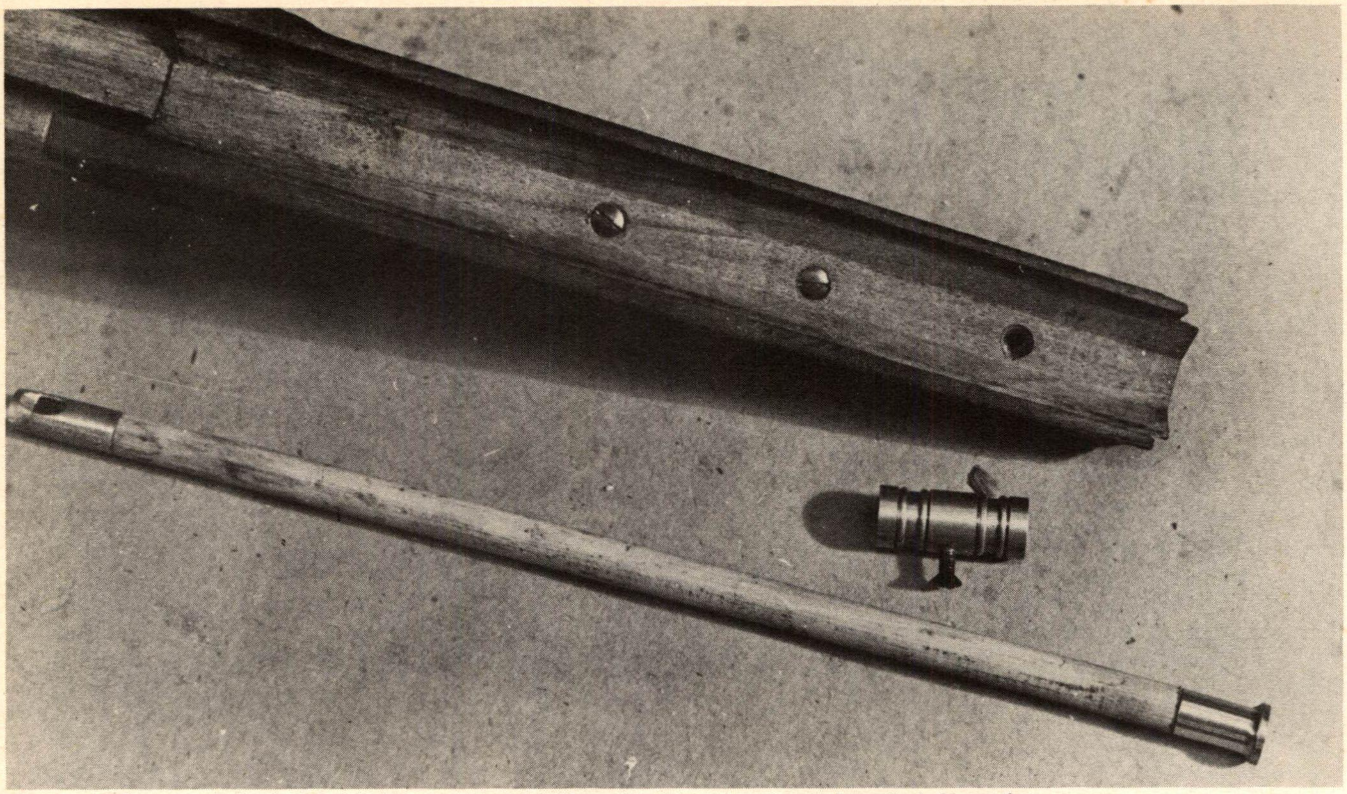
The next step is to secure the front end of the barrel. On some kits this is achieved by cross pins or wedges passing through the sides of the wood forend and also through a metal hook or slotted extension on the barrel. The Hawes kit uses a different solution, in the form of a brass nose cap. The front of the wood is held in a recess in the nose cap, while the nose cap is secured to the barrel by screws.

If the barrel channel is correctly inletted, as it was in this kit, the barrel will lay flush with its inletted recess with no gap between wood and metal at the muzzle. If there is a gap, then, obviously, the wood is not properly inletted.

If this occurs, check the barrel channel full length. Look for splinters of wood sticking up and creating the obstruction. Remove these with your wood scraper. Run your fingertip up and down the length of the barrel channel, bottom and sides. If you feel a bump, this probably is the obstruction causing the gap at the muzzle. Coat the bottom of the barrel with a thin layer of inletting black – the thinner the better.

With trigger assembly and lock removed, but not the tang screw, line up the tang screw with its hole in the stock. Now carefully press the barrel straight down into the barrel channel in the stock. Do not cock one end of the barrel; it must go down evenly. When seated, grasp barrel and stock halfway the length of the barrel. Close your fist to pull them together, ease up on the pressure and carefully lift the barrel straight up, keeping it level with the stock.

The bump or bumps in the inletted barrel channel will



*The ramrod assembly includes thimbles and screws. Two thimbles already are installed. Note that screws to hold the thimbles to the stock enter from the barrel channel. They must have heads below channel level.*

have inletting black on them, while the other sections will be clean. Use your wood scraper to remove the marked wood. Go slow, removing only a small amount of wood. Spread your inletting black over the metal surfaces and repeat the process of putting the barrel in its channel, exerting pressure and removing the barrel. Scrape the marked wood again. This is repeated again and again until the gap at the muzzle is eliminated. You will note that, as you get closer to inletting enough to eliminate the gap, more and more wood will bear the inletting black imprint. A perfect fit would be the full length of the barrel blackened, for the coated metal would be in full contact.

Now carefully try the ramrod assembly in its predrilled hole in the stock. It should go in with mild pressure. Do not force it into the hole. On some kits you will have to clean out the hole with a little sandpaper wrapped around a smaller dowell or metal rod. Usually, it is just slivers of drilled wood preventing the ramrod assembly from seating.

The next step is to install the ramrod thimbles to the stock. Try the screws in the threaded holes in the thimbles and work them back and forth with a screwdriver if there's any bind. The screws go through the stock from the top in predrilled holes and screw into the thimbles. Pull them up tight, and make certain that each screw head is seated below the level of the barrel channel. If they protrude, the barrel cannot fully seat in its channel and you will have a gap between barrel and wood at the muzzle. If a screw head does protrude, use a drill the size of the screw head to deepen the countersink for the screw head.

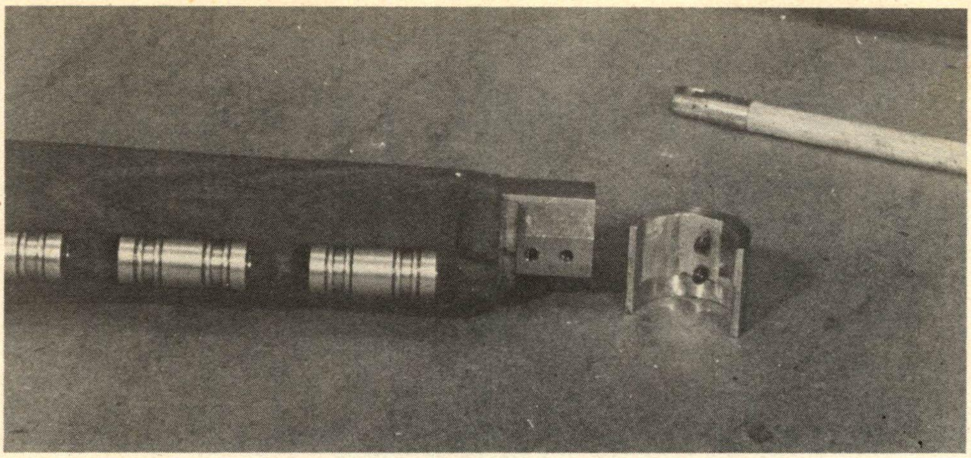
With the thimbles secured, try pushing the ramrod assembly through them slowly. If you encounter an obstruction, stop. Either the thimble is not in line or more than likely one of the screws is too long and will have to have the end filed flush. The ramrod assembly should be a snug fit, but enter and exit with only mild pressure. Remove the ramrod assembly temporarily.

Press the brass nose cap up against the tip of the wood forend, keeping it level and straight. It should fit the wood firmly in the recessed rear of the nose cap and, at the same time, be snug against the bottom of the barrel. Check the nose cap screw holes to see if they line up with their predrilled and threaded holes in the bottom of the barrel. This kit did not.

The wood forend tip should not be cut away to obtain a snug fit of nose cap and barrel. You want as much wood thickness as possible for, when the gun is fired, there is a normal tendency for the barrel to rise at the muzzle end. The correct solution is to use a large-diameter grindstone to cut the recess in the rear of the nose cap to match the wood. The grindstone on a Dremel Moto-Tool will remove brass fast, so go slowly. Remove only a small amount.

Hold the barrel and forend wood steady and try slipping the brass nose cap straight back. If it will not slide over the wood forend tip and remain in full level contact, more brass must be removed. Use the grindstone again, taking care to keep the recess the same shape as the wood tip. Check by placing the brass nose cap on the wood tip, but don't try to make the brass angle up to the barrel.

You want a snug fit of the wood tip resting in its recess in the nose cap, requiring just a wee bit of pressure to pull the nose cap level and up to the barrel. When you are close, it may be necessary to use a metal file to remove just a tiny



*Ramrod thimbles attached, the nose cap is ground to fit and is ready for attachment to the front of the stock and barrel to secure wood to the barrel.*

bit of the wood tip. You don't want a sloppy and easy fit, so grind and file carefully.

When you can make the wood tip, nose cap and barrel pull up snug using just the pressure of your thumb and forefinger, you have a perfect fit. Now install the nose cap screws, pulling them up tight. With the nose cap securing the barrel and wood at the muzzle and the tang screw doing the same at the rear, you have correct barrel and stock fit.

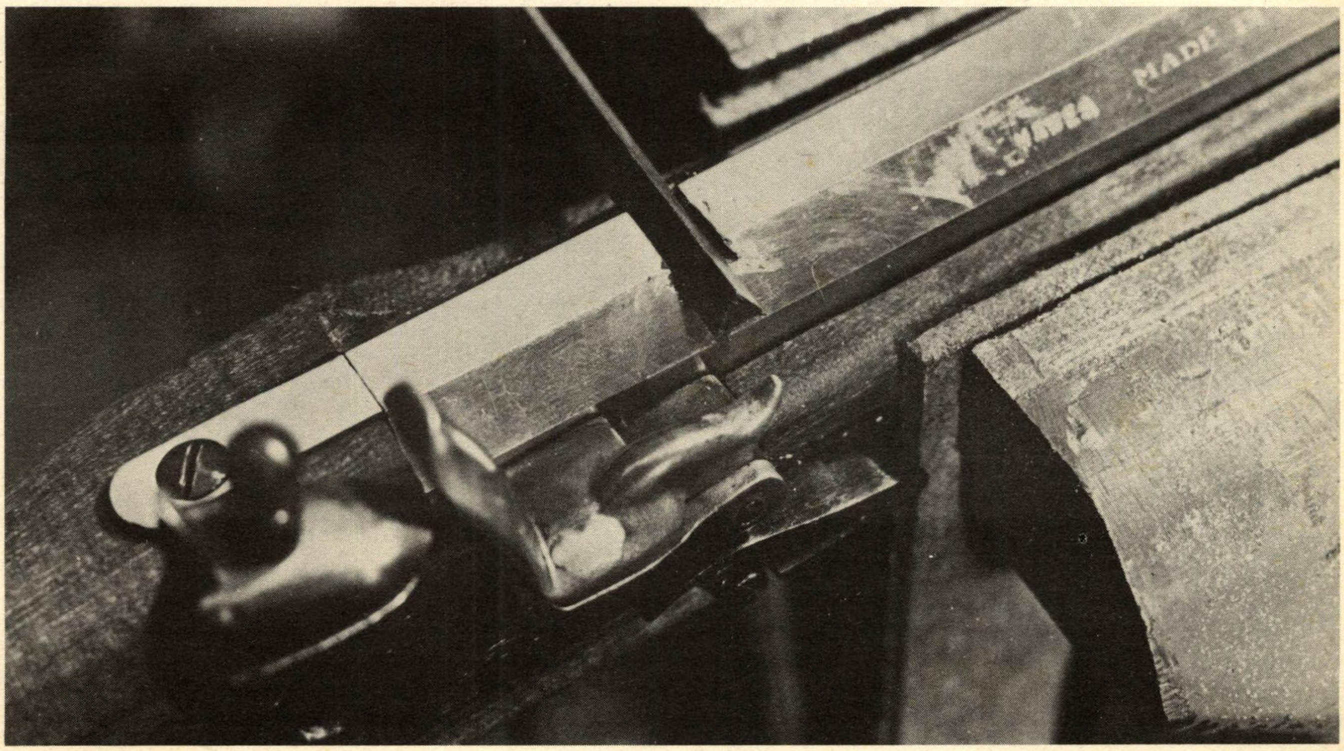
With barrel assembled, trigger assembly in place, lock secured and functioning correctly, it's time to tackle the brass trigger guard. On the sample kit it is a separate piece held by two screws. Other similar kits combine the trigger guard and trigger group as a single assembly.

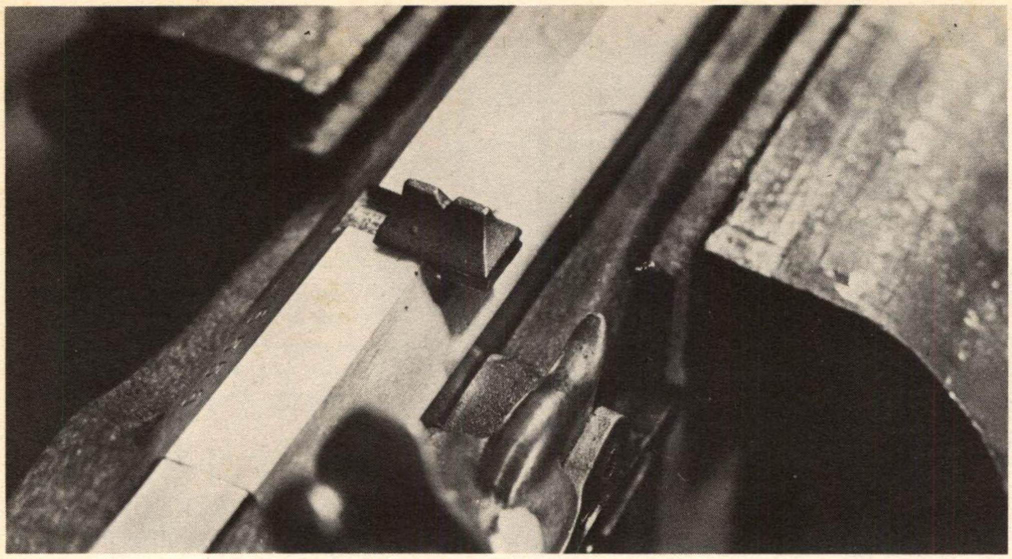
The front screw is a metal screw that attaches to the trigger assembly in a predrilled and tapped hole. This screw must take precedence. With the sample kit it was necessary to clean out the inletted wood recess with a wood scraper. At this point you only want the front end of the trigger guard to fit its inletted stock recess and the screw holes to line up. Place the screw in position but do not tighten.

The rear end of the trigger guard on the Hawes kit was too long to fit into its inletted recess in the stock; it is a bad mistake, however, to try and compress the trigger guard to make it fit – brass is brittle and has little spring action.

The distance from the front screw to the end of the trigger guard was measured and compared to the rear screw hole and rear end of the trigger guard. The rear end was much longer. Now there was the choice of filing off some of the metal end of the trigger guard or making the inletted recess longer in the wood. Either way is all right, but I chose to file the metal to match the wood, as this would make both screws about the same length from the trigger

*Author shapes the rear sight dovetail in the barrel. Note that the file's cutting edge is angled slightly. The result of this is that the right side of the dovetail is slightly wider than left, allowing for mounting the sight.*





*With the channel filed, sight is pressed into place with the thumb. It is driven in the rest of the way with a punch. Note the sight has been left rough to reduce glare when sighting.*

guard ends. Only a small amount of filing was necessary for a good, snug fit.

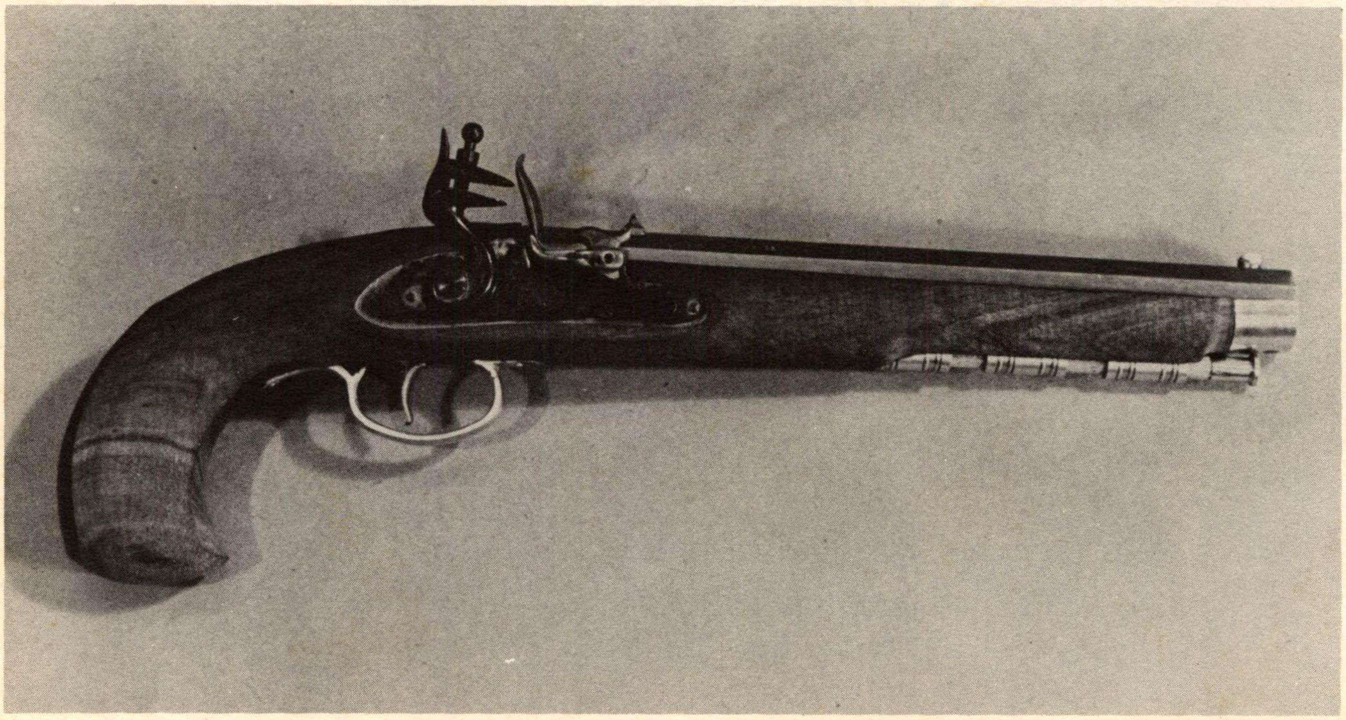
The rear screw is a brass wood screw, so a hole must be made in the wood. You can drill a hole in the wood if you wish. With a small screw such as this, all you need is a small, sharp scribe or ice pick. Make a small hole, just large enough for the screw to start, then use a screwdriver to pull it in tight. Finally, check to be sure the trigger guard does not touch the trigger.

The next item on the agenda is the rear sight. This involves cutting both male and female dovetails. Start with the sight itself. It is a well-made steel investment casting and, like all investment castings before machining, has a light, pebble-rough appearance. Use a triangular sight file to clean up any rough spots on the male dovetail – just a small amount of filing is necessary. With the sight belly up and secured in a vise, angle the file about five degrees and cut both sides of the male dovetail to a slight taper. One end is left the original width.

If you wish, you can use a Dremel Moto-Tool with a polishing point to smooth the top section. Personally, I prefer the lightly rough pebble appearance. When blued or browned, the surface does not reflect light and gives more contrast to the front sight. The V notch should not be changed at this point, as this is done when shooting and sighting-in the pistol for elevation adjustment.

Next, try the smoothed-up sight dovetail in the precut female dovetail on the barrel. It probably will not enter, as the barrel dovetail is purposely cut too narrowly to assure a good fit. If you have little experience in filing dovetails in a

*The right side of the gun is shown. Fully assembled but not finished, it is ready for the author's test firing.*



barrel, it will be best to remove the lock for more room. Again, use a triangular sight file, held at a five-degree angle to the dovetail with the cutting edge facing the muzzle. What you want to achieve is a light taper on the dovetail slot to match the male sight dovetail. Remember that all dovetail sights go in from the right side when the muzzle is pointing away from you. Do not deepen the slot, cut only on the sides to widen the slot with the wide part of the angle on the right side.

Remove only a small amount of metal from both sides of the slot. Now try pressing the sight into place with your thumb to see how much metal has been removed. Again, we have that basic fundamental of cut and try, cut and try, for a good, snug fit. It never changes, wood or metal!

When you reach the point where the sight can be pressed into the slot slightly less than halfway with your thumb, stop! Select a large diameter punch. Many gunsmiths use a brass punch to install sights, but I have found that in so doing small particles of brass are imbedded in the metal and, naturally, will not blue.

The trick is to use a metal punch of large diameter with a smooth end. Equally important is not to allow the punch to bounce as you tap the rear end with a series of light blows. Follow this procedure and the sight will not be marred. Slowly tap the sight in until it is centered. If the barrel dovetail edges start to be pushed up by the sight, stop and tap the sight back out. You will have to file the dovetail a wee bit wider at this point, but remove only a small amount of metal. The sight should now tap into place, solid and secure.

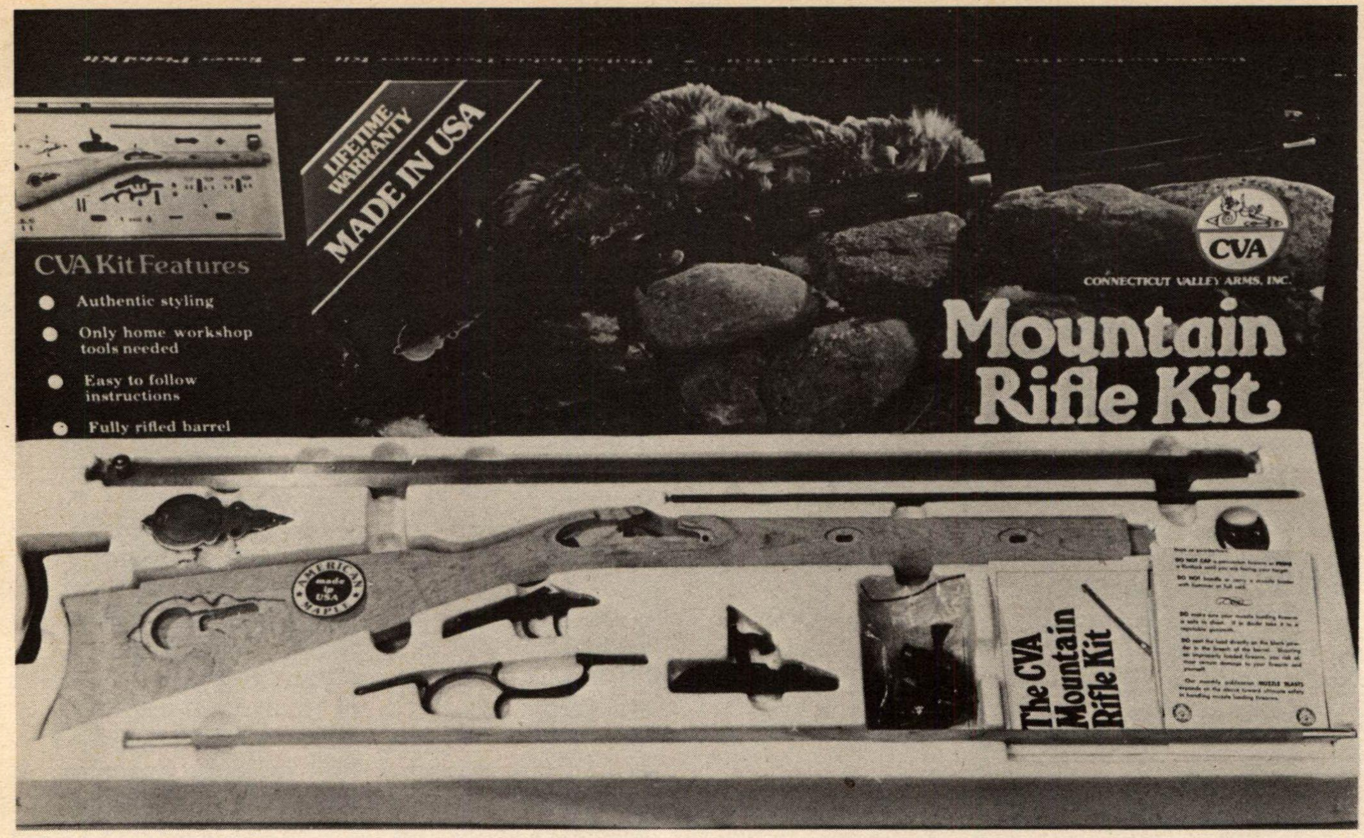
The front sight is brass and has a threaded shank to match a predrilled hole in the barrel. To avoid marring the sight, place a piece of paper folded several times between your pliers and sight blade. If the blade will not line up parallel with the barrel, unscrew it and file a small amount of brass off the bottom of the top section. This allows the screw to go in farther until the sight bottom's flush with the barrel. If you removed the lock to install the sights, reinstall it and pull the screws up tight. The next step is to go back over every part and component, checking to be sure you have not forgotten anything.

Assembling a kit is not much different from building a complete custom gun from scratch. All of your efforts and concentration should be directed towards fitting every part and component to assure correct gun function.

Shaping and finishing the stock, shaping or polishing the metal, and metal finishing are done only after the gun is assembled for proper function. If you have made a mistake, it can be corrected. If you rush in to finish wood and metal, only to find the mistake later, it is twice as hard to correct the mistake.

Have a gunsmith or knowledgeable black powder shooter inspect your work. Safety is the number one priority. If it passes inspection, you are ready to test-fire the gun before proceeding to finish the wood or metal. Use a light charge and blank load, no projectile for the first several shots. Examine the gun closely after each blank shot. Next, use a light charge with a projectile. Again repeat your inspection after each shot. Work up the load slowly to the full charge, examining the gun closely after each shot. You can adjust the sights for windage by moving the rear sight left or right. Elevation adjustment is made by selection of the powder load, projectile, or by filing the notch in the rear sight or decreasing the height of the front sight by filing.

Now, and only now, are you ready to start shaping and finishing the wood and metal. Remember, on any gun kit, assemble for function first, test-fire second, and third perform wood and metal finishing.




*The Connecticut Valley Arms' Company Mountain Rifle Kit in .50 caliber muzzleloader, as received, ready to build.*

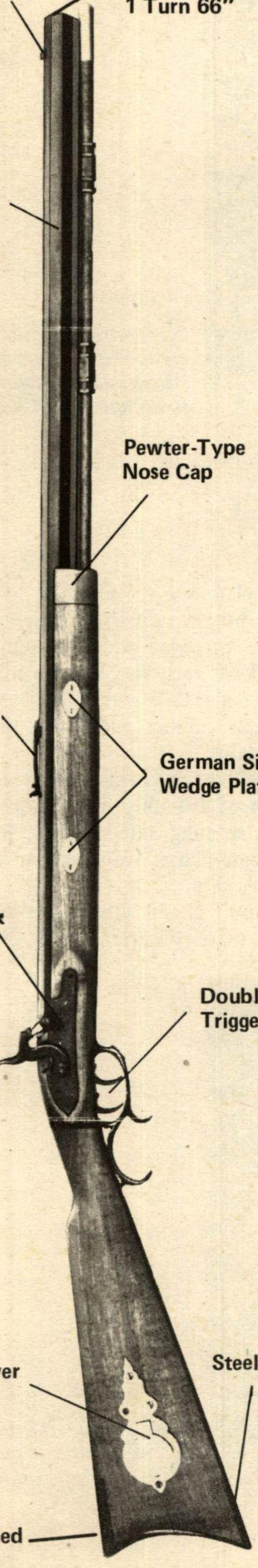
## CHAPTER 8

# CONNECTICUT VALLEY ARMS' MOUNTAIN RIFLE

PERHAPS NO MODERN muzzleloading rifle has captured the imagination of today's shooters as much or received as much attention as the mountain or plains-type rifle. The get-rich-quick crowd jumped on the bandwagon, and any half-stock heavy barrel rifle suddenly became a Hawken rifle. What they lacked in quality or historical accuracy, they made up for in brass, metal and otherwise.

The American public, especially gun buffs, are not easily fooled. It did not take long for the word to spread, and the get-rich-quick crowd has slowly but surely crawled back under the rock to wait for the next bandwagon. Thankfully, we now have reputable companies offering the public

## This Kit Closely Follows Important Details Of The Early Mountain Or Plains-Type Rifles




# SPECIFICATIONS

### LOCK

Same engraved CVA percussion lock that's used by custom gun makers.

Fully adjustable sear engagement with bridle and fly in tumbler.

Two lock screws, not one, for greater strength.

### STOCK

Historically correct • American Maple — the old-timer's first choice — with fully formed cheek piece.

### BARREL

Available in .45 or .50 caliber • 15/16-inch across the flats • Rifled 1 turn in 66" for superb patched ball accuracy.

Hooked breech for easy take-down • 2 barrel wedges for secure lock-up • additionally, tang screw locks into trigger plate for extra stock strength.

Machined (not cast) breech plug for maximum strength.

### TRIGGERS

Double set type • Normal trigger weight, unset; light trigger weight when set • screw adjustable.

### SIGHTS

Fine German silver blade front sight and dovetailed rear that is screw adjustable for windage and elevation

### FINISH

Authentic brown steel • German silver patchbox and wedge plates plus pewter-type nose cap.

### ACCESSORIES

Stainless steel nipple • hardwood ramrod and cleaning jag.

### OVERALL LENGTH

48 inches

### WEIGHT

8 pounds

### MODELS

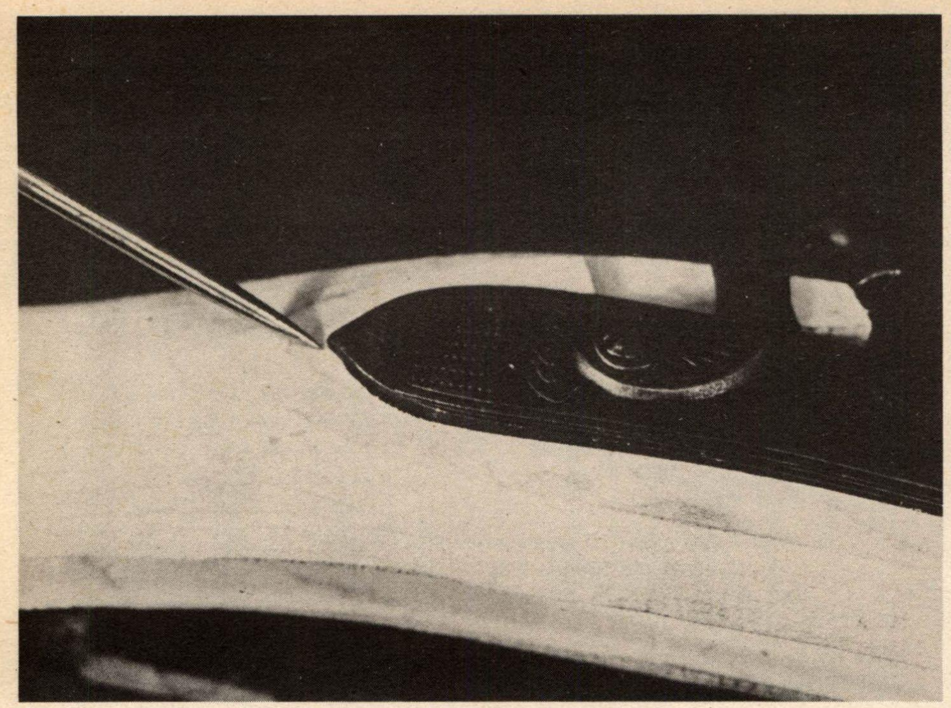
PR 405 (.45 cal. percussion)
PR 406 (.50 cal. percussion)

quality products patterned after the mountain or plains-type rifle.

Necessity is the mother of invention and the mountain or plains rifle is a perfect example. The long, slender and graceful Pennsylvania or Kentucky rifle was the end result of trial and error to meet a specific need in a specific geographical area. As the American frontiersmen and pioneers pushed steadily westward, a different set of circumstances confronted them and the Pennsylvania/Kentucky-style rifle did not fulfill their needs.

Their fathers and grandfathers had settled an area primarily on foot. The new generation traveled on horseback, usually with a pack horse or mule carrying their tools and equipment. The mode of travel, more than any other single factor, led to the development of the mountain or plains rifle.

The long, graceful barrel became a liability more than an asset. The same was true of the equally narrow stock. The shorter barrel was more easily carried on horseback. The thicker stock was less prone to break in a fall. With a heavier barrel, a more heavier and powerful charge was practical. Like its predecessor, the rifle developed slowly but surely through trial and error to meet the new needs.



*Pre-inletting of stock is not complete at point indicated. Wood must be carefully removed to accept rear of lock plate.*

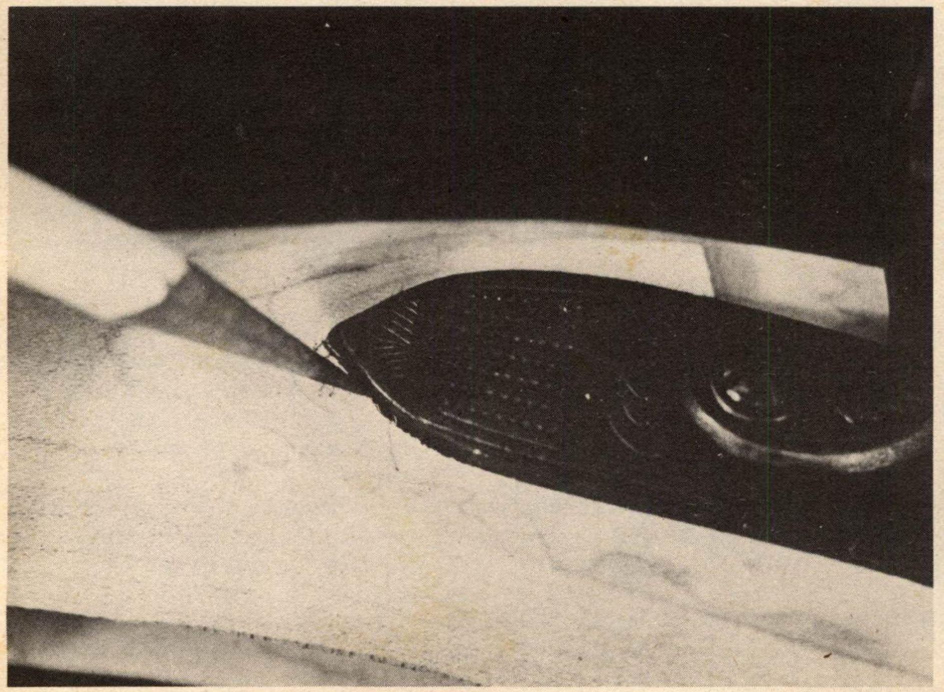
To term every rifle of this pattern a Hawken rifle is incorrect. There is no doubt that Jake Hawken of St. Louis, Missouri, played an important role in its development, but the same can be said of other gunsmiths whose names have been lost to history. If we are awarding credit, do not forget the men who used the rifles and whose comments and suggestions were translated into wood and metal.

The vast majority of the mountain or plains rifles were rugged and dependable guns built for practical applications. Most were as plain as possible, absent of frills except for those few customers who wanted a little touch-up in appearance. The very plainness of the rifle is appealing.

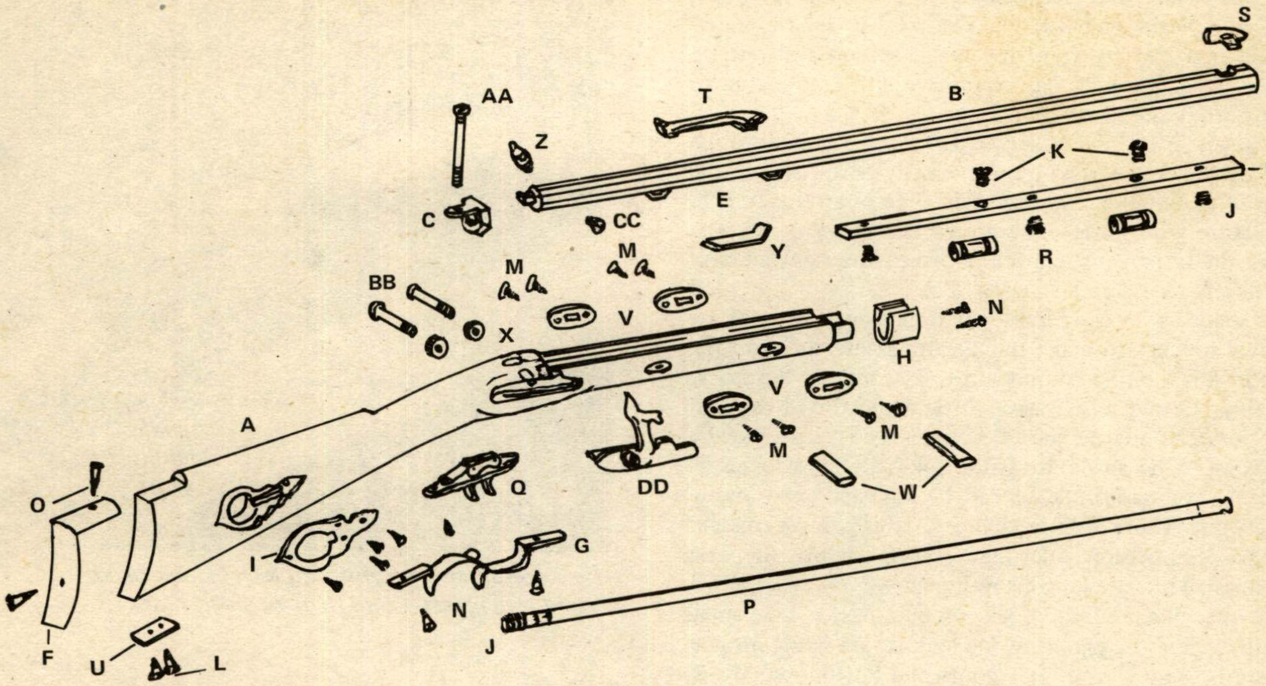
Connecticut Valley Arms' mountain rifle closely follows the important details of the average rifle of this pattern. The steel butt plate and toe plate are of good iron, rather than the fancy but less durable brass. Two barrel wedges, rather than one, provided added insurance – both on the originals and CVA's version. CVA has added a few modern touches, such as a stainless-steel nipple that does not distract from the appearance and makes the rifle more practical and dependable.

The kit is well packed in styrofoam and contains a well-written booklet of assembly instructions and other useful information in handling, safe shooting, loading recommendations and maintenance. Another important content is a lifetime warranty card.

The first step in assembly is the same for all kits. Read the instruction material several times, then study the ex-



*Lead pencil with sharp point marks outside of point of lock plate, as described in text.*




## PARTS

| LETTER | DESCRIPTION | LETTER | DESCRIPTION |
|---|---|---|---|
| A. | Stock | O. | Butt Plate Screw (2) |
| B. | Barrel — without tenons (.45) | P. | Ramrod |
| B. | Barrel — without tenons (.50) | Q. | Set Triggers (Assembly Only) |
| C. | Tang | R. | Thimble (2) |
| D. | Barrel Rib | S. | Front Sight |
| E. | Barrel Tenon (2) | T. | Rear Sight (Assembly Only) |
| F. | Butt Plate | U. | Toe Plate |
| G. | Trigger Guard | V. | Wedge Plate (4) |
| H. | Nose Cap | W. | Wedge (2) |
| I. | Patchbox | X. | Side Plate Washer (2) |
| J. | Jag | Y. | Ramrod Retaining Spring |
| K. | Rib and Thimble Screw (5) | Z. | Nipple |
| L. | Patchbox and Toe Plate Screw (6) | AA. | Tang Screw |
| M. | Wedge Plate Screw (8) | BB. | Side Plate Screw (2) |
| N. | Nose Cap Screw, Trigger Guard & Trigger Plate Screw (5) | CC. | Bolster Screw |
| | | DD. | Lock |

## TOOLS NEEDED

1. Small flat file
2. Small chisel or carving tool
3. Spotting compound (Prussian blue, lipstick, lamp black)
4. 1/16", 1/8", 3/16", 1/4" drill bits
5. Sandpaper, emery paper and steel wool
6. CVA Finishing Kit or stock and barrel finishing materials
7. Drill

**"Use Black Powder Only"**

ploded diagram and parts list. Only when you understand where each part and component fits, and its purpose, should you begin constructing the kit. As I have stated before, I may deviate from the manufacturer's procedure sequence based on personal experience, but I never fail to carefully study the instructions.

Obviously, a lot of thought and study has gone into the design of this kit. I was, quite honestly, surprised at the quality of material and workmanship. The barrel is of U.S. manufacture with close tolerances of its components. The stock is ninety percent inletted with just the right amount of wood left to assure a snug fit. The exterior of the wood is fully shaped with good lines, yet ample wood remains for individual touches to make the kit into a personalized rifle.

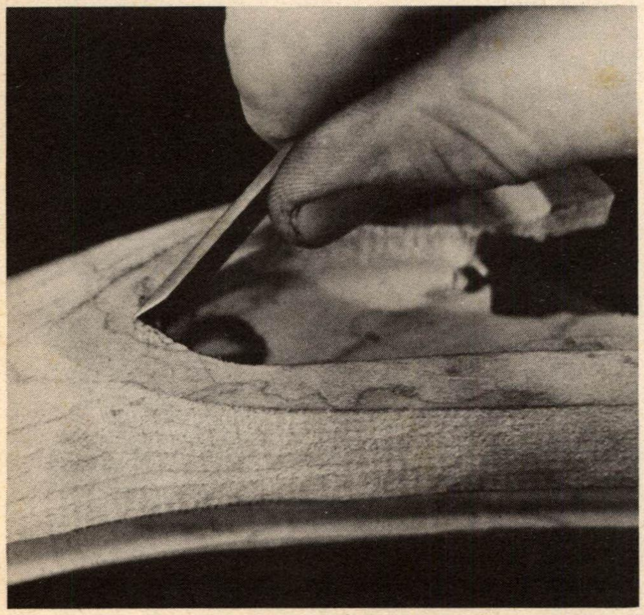
The lock is the first component to assemble to the stock. Its closely inletted recess leaves little room for adjustment of position. The inletted barrel channel also is close, but if a choice has to be made to achieve correct lock to barrel alignment, the barrel always can be adjusted more easily with any kit. There is little chance of this being necessary with CVA's precision inletting – it is simply the best method, as all kits are not this well made.

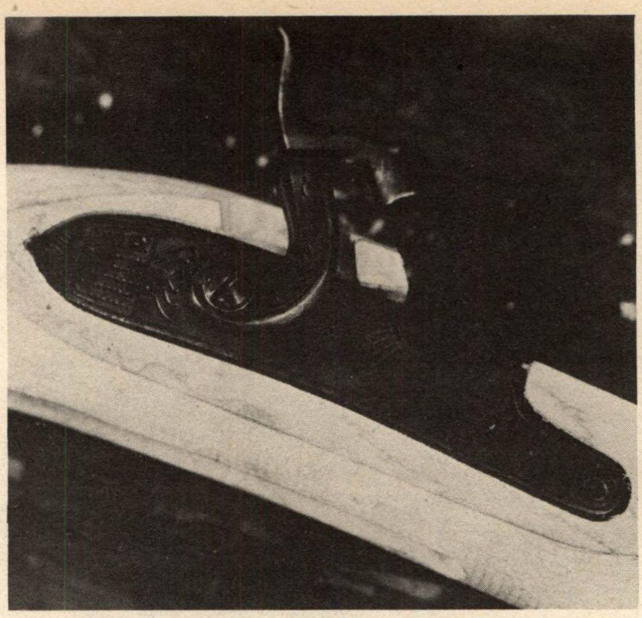
Any machine-inletted stock usually has a few small wood slivers that may prevent the lock from seating properly. Use a flat-end scraper to smooth the bottom wood surface and remove any wood slivers. Remember that this step is only a cleanup operation, so do not inlet the recess deeper. Also, do not scrape the walls of the inletted recess.

The rear end of the lock plate is pointed, the front is rounded. Hold the lock parallel with the wood, the rounded front end pressed hard against its recess, and press the front end downward slightly to establish good contact with the wood. Using a sharp, pointed pencil draw a close line around the rear pointed end of the lock plate. Angle the pencil so that the marked line will be as close as possible.

Remove the lock and examine your pencil mark. To make a precision cut, use a sharp chisel and apply hand

*Sharp chisel and only hand pressure is correct method of removing stock wood along penciled lock plate recess.*





*After careful removal of wood, lock plate is hand pressed into recess. Close fit gives quality look.*

pressure only. Anytime you mark around a part or component, remember that the mark is outside the part or component edge; therefore, you always cut inside the marked line. Never cut on the line as this will result in a gap. In fact, your first cut should be slightly short of actually touching the line. You can, if necessary, always make a second cut, but if too much wood is removed, you have created a problem. Clean away all wood chips.

Hold the lock parallel with the stock, ease it into position and apply thumb pressure only at the center of the lock. On the sample kit the lock went in about halfway. Remove the lock and examine the walls of the inletted recess. Where the wood is binding the metal, the wood will be lightly compressed and easily noted. The wood scraper was used, very lightly, with the scrapings resembling dust. On the next try the lock pressed easily into place for a close wood-to-metal fit.

With every kit, regardless of manufacturer, always check the fit of screws into their drilled and threaded recesses. It is good practice to use a screwdriver to turn them in and out several times with light lubrication. This act burnishes the threads of the screw and recess to assure a good fit and prevents binding during assembly.

With the lock in place, fully seated, insert the two side-plate screws before installing the side-plate washers. The purpose of this step is to check the alignment of the pre-drilled side-plate screw holes with the lock. Although it was not necessary with this kit, if the holes do not align you can use a rounded needle file to enlarge one side of a hole to achieve alignment. It is better to take this step before the side-plate washers are in position, if the step is necessary. The alignment was correct on the CVA kit, so the screws were removed and the side-plate washers pressed into their recesses. They also aligned correctly and the screws were reinstalled and tightened.

The kit is equipped with a patent breech, the tang being a separate piece permanently secured to the stock. The barrel breech plug has a male hook that enters the recessed

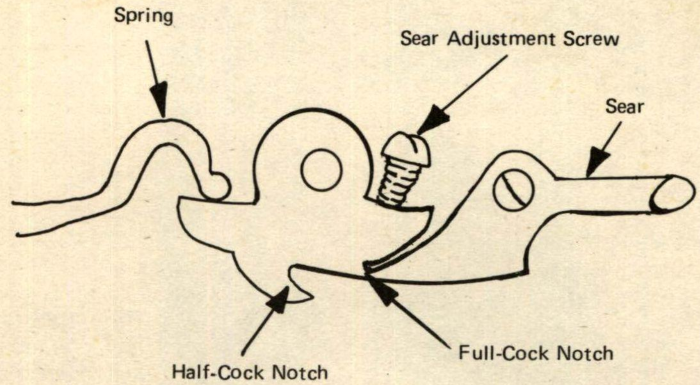



**Illustration No. 1**

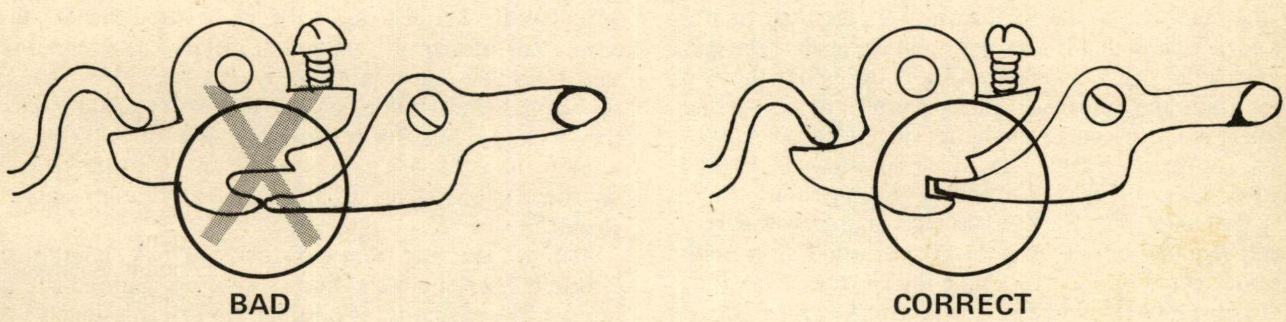



**Illustration No. 2**

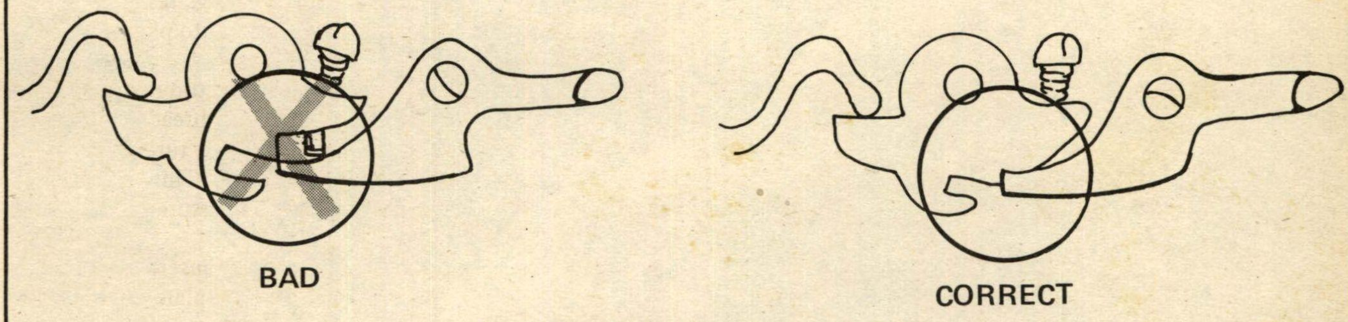
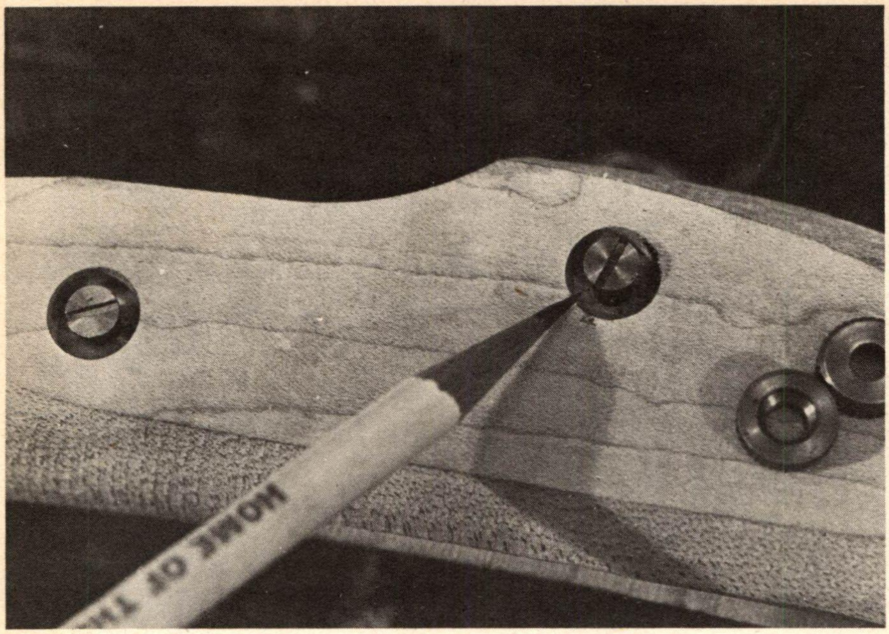



**Illustration No. 3**

*Always check half-cock position of sear before relying on it. First and most important step is to check lock function. Gun should have secure and solid half-cock position as in illustration 1. Set at half-cock, it should be impossible to drop the hammer with any amount of force. At full-cock, the sear must have ample engagement with full-cock notch and no hair trigger. Sear adjustment screw must not be adjusted to the point beyond full face of sear point, illustration 3.*



*Rifle stock is pre-drilled for lock plate screws. Checking alignment is done before adding washers, shown at right of pencil.*

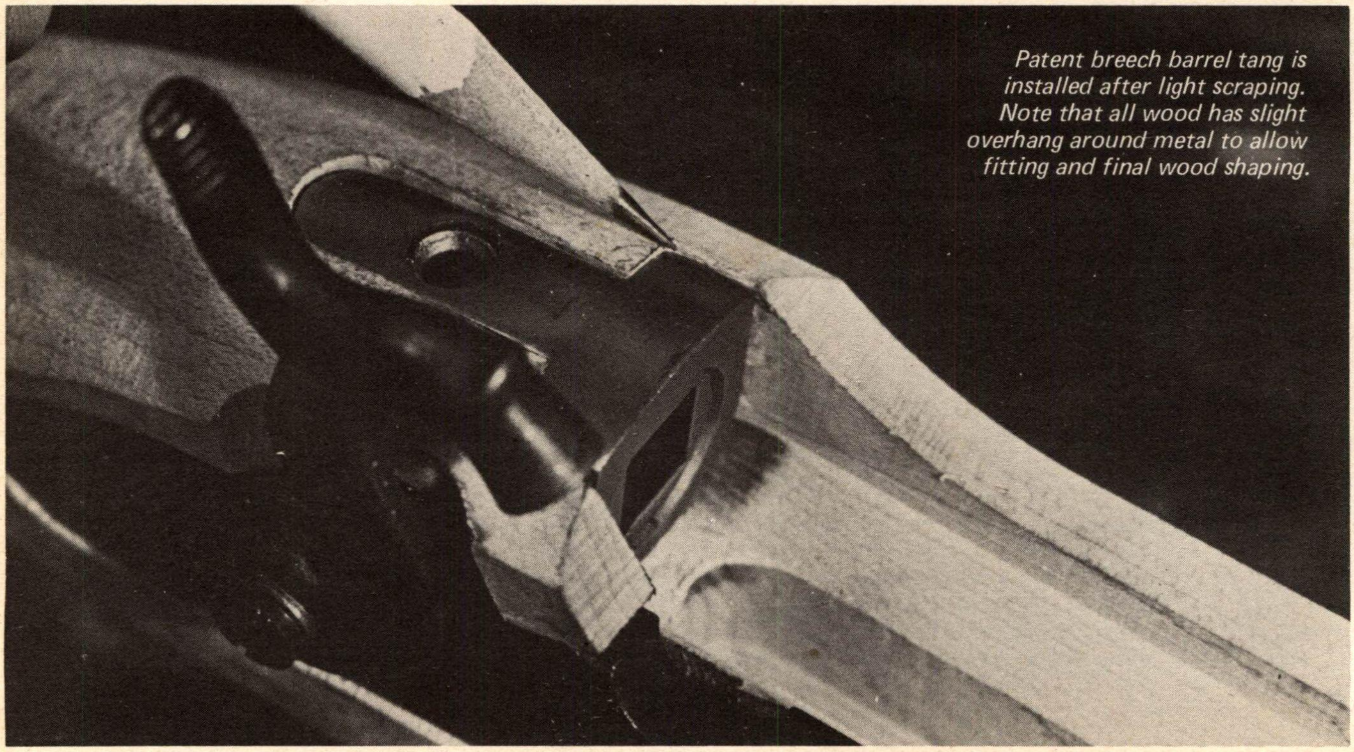
tang to secure the barrel to the stock at the rear. Its primary advantage is that it greatly simplifies cleaning the barrel after firing. All that is necessary is to remove the two wedges from the forearm, lift the barrel muzzle up and unhook it from the tang. The barrel then is quickly free of the gun for easier cleaning. An added advantage is that the stock wood is not subjected to spilled cleaning solutions.

On the sample kit, the pre-inletted tang recess was very close. It required only a light cleaning of wood slivers with the wood scraper to achieve a snug fit. The tang screw hole in both tang and stock lined up perfectly. As with all metal components, check for burred metal that may prevent a good fit to the wood.

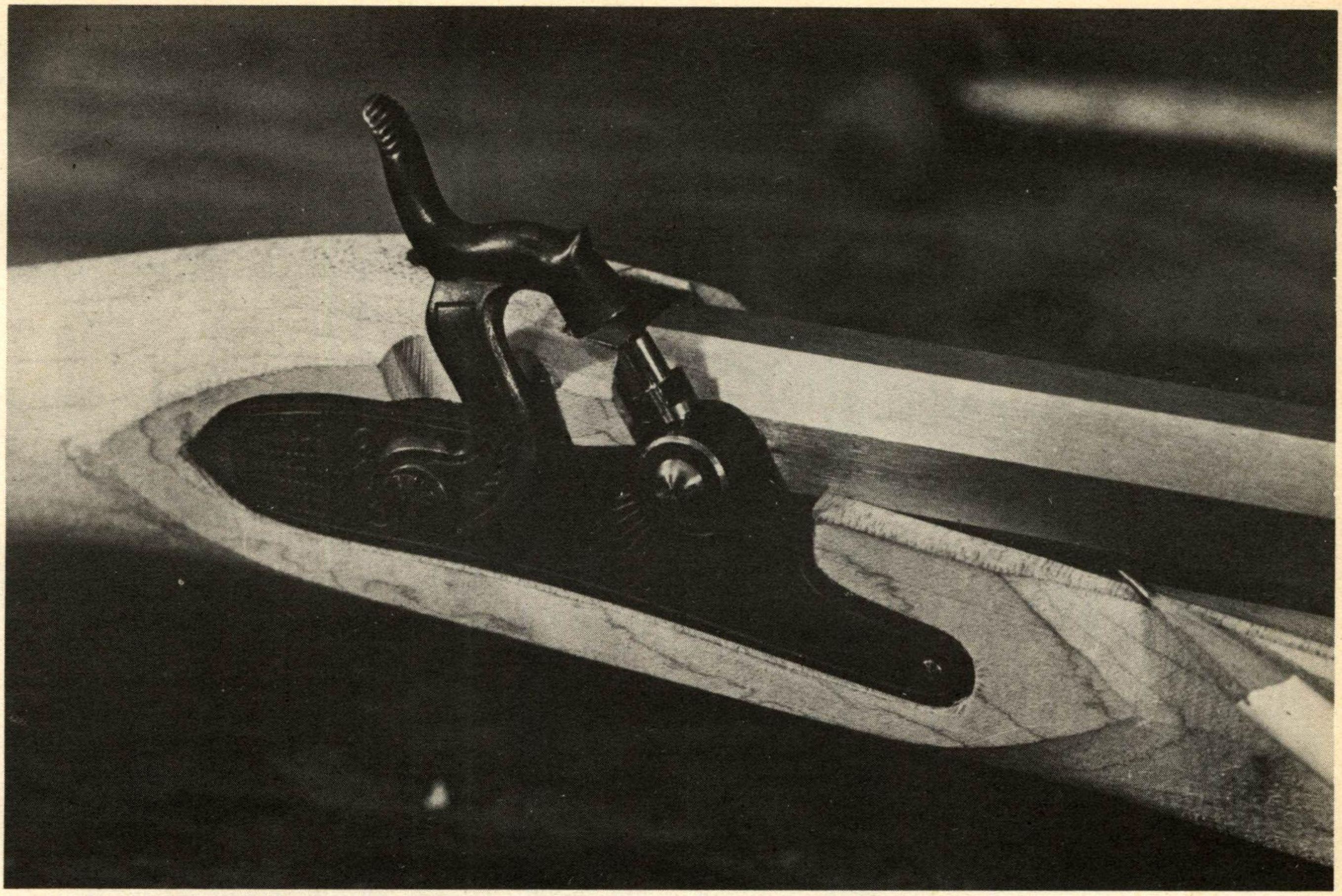
The fit of tang and barrel plug extension must be tight, yet allow the barrel to seat in its pre-inletted channel. With any patent breech, the amount of metal to be removed will vary from one gun to another. To get a basic idea of the fit, slip the barrel into the tang while the tang is still in place on the stock. Do not try to force the barrel down! You only want to have some idea of the amount of fitting required on the two metal parts before the barrel will seat in its channel.

Remove the tang from the stock and look closely at the female recess. Any metal burrs should be removed and the recess made as smooth as possible. No fitting is done on the tang by filing or grinding. All you want is a clean, smooth recess with the original lines and angles preserved.

Secure the barrel in a vise, muzzle toward the floor, with



*Patent breech barrel tang is installed after light scraping. Note that all wood has slight overhang around metal to allow fitting and final wood shaping.*



*Barrel male plug is test-fitted in tang female recess to determine extent of metal fitting to seat barrel.*

just enough barrel above the vise for easy working space. Try putting the tang into position and note the gap at the bottom. Remove the tang. With a narrow pillow file, clean the rear of the barrel and plug. Remove all metal burrs and rough areas. Lightly bevel all the edges of the plug. This operation should be only to smooth up the area, so remove as little metal as possible. Go slow!

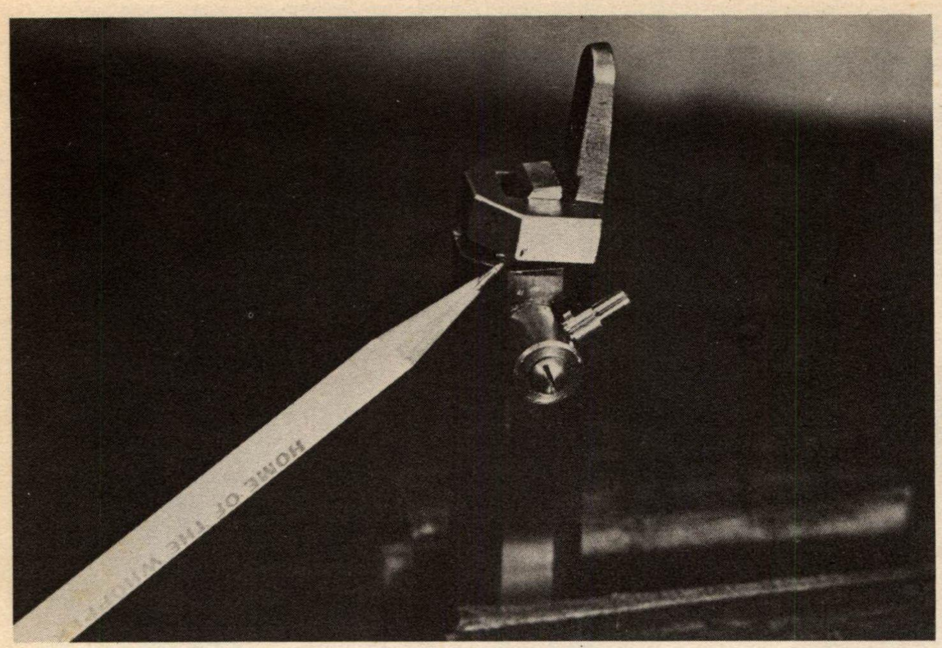
Try the tang back on the barrel plug hook. The gap at the bottom should be less. To decrease the gap, file a small amount of metal off the back side of the plug hook, which will be toward the muzzle end of the barrel. Try the tang in place again. If the gap is still there, this time remove a small amount of metal from the bottom flat of the plug hook. Try the tang in position again. Keep repeating this cut and try the method again and again. Do not try to make one big single cut. Go slow in filing and when the gap is almost closed, stop. Leave a very small gap, about the thickness of a piece of typing paper.

Reassemble the tang back on the stock with the tang screw in place. Install and remove the barrel several times. The barrel should not quite seat in its channel. The tiny gap you left will slowly close as the barrel is installed and removed during assembly of the kit, as the two sections mesh and work themselves in for a perfect fit. Remember that, if necessary, you always can go back and remove additional metal by filing. This way you allow for normal wear and avoid a sloppy fit.

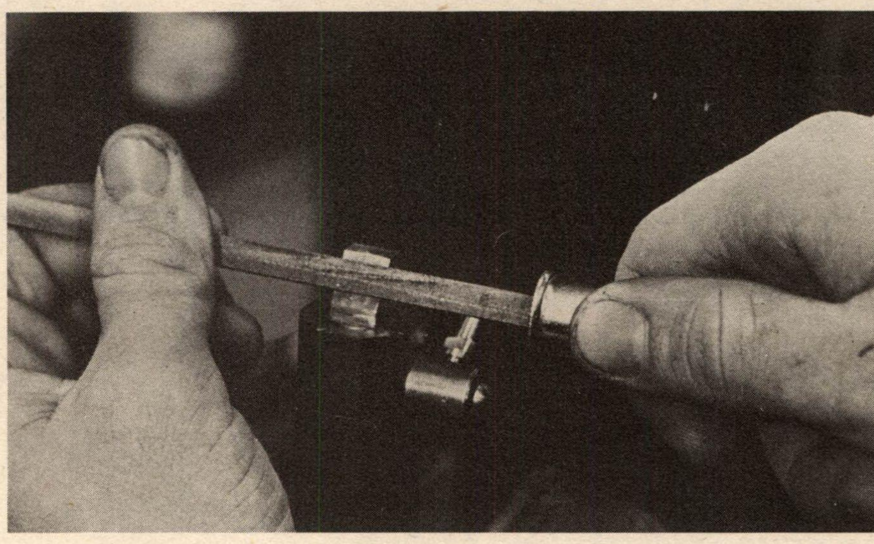
The next point of business is to install the double-set trigger assembly. Before any attempt is made, check for metal burrs and smooth them up if any are found. Try the tang screw in its threaded recess, turn it in and out several times to be sure it enters easily and does not bind.

This type of set trigger is dual action. Pulling the front trigger lifts the trigger blade and you can fire the gun this way. Pulling the back trigger first sets the front trigger, where only a hair-like touch on the front trigger will fire the gun. Check the trigger both ways to be sure it is functioning correctly. If the front trigger will not set or is too light, back off on the set screw located between the two triggers. Right now you just want them to function, as final adjustment is made after the kit is assembled. Now note the small, wire spring at the front of the trigger assembly. When the trigger is assembled, this spring must not touch wood. It must be free or the set trigger will not function. If necessary, some wood will have to be cut away in the inletted recess at this point to assure its free function.

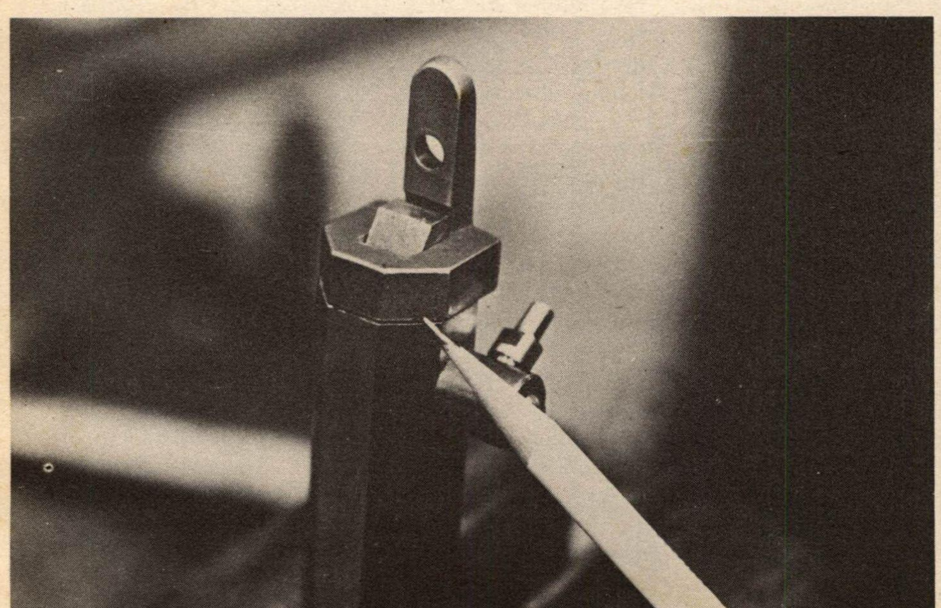
Ease the trigger assembly into its inletted recess using finger pressure only. With the sample kit, only a light cleaning pass with the wood scraper was necessary to achieve a snug, full-depth seating. Now check the alignment of the tang screw and its threaded hole in the trigger assembly. On the sample kit it was off just a small amount, but after a few strokes with a round needle file the screw lined up perfectly. Pull the tang screw up tightly. Next check the freedom of movement and function of the dual-set triggers. In this instance, there was no need to remove wood to



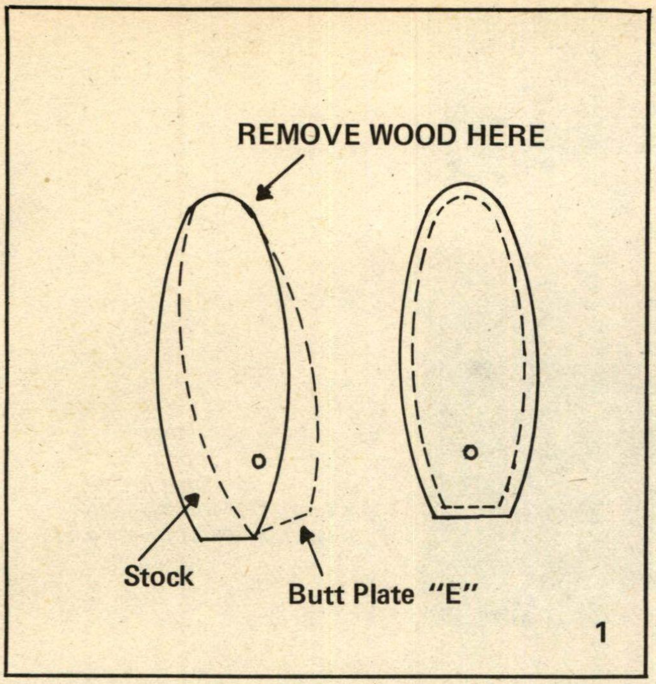
*Hold barrel in vise during initial test-fitting of barrel tang and plug. Gap at pencil point must be reduced as outlined in text.*

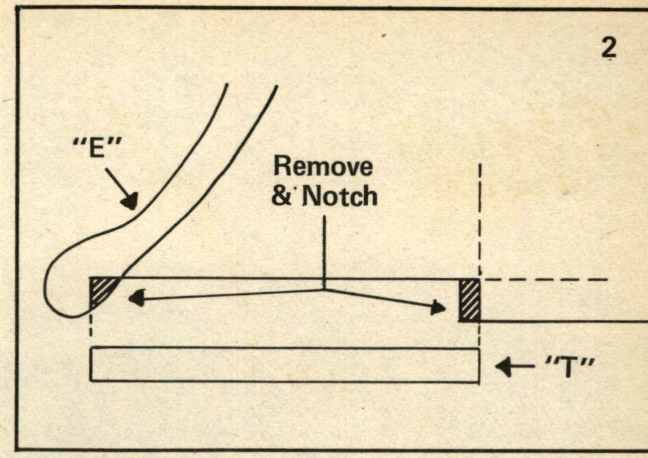


*Narrow pillow file is used to shape barrel plug to mate with female tang recess. Text describes cut-and-try fitting technique.*



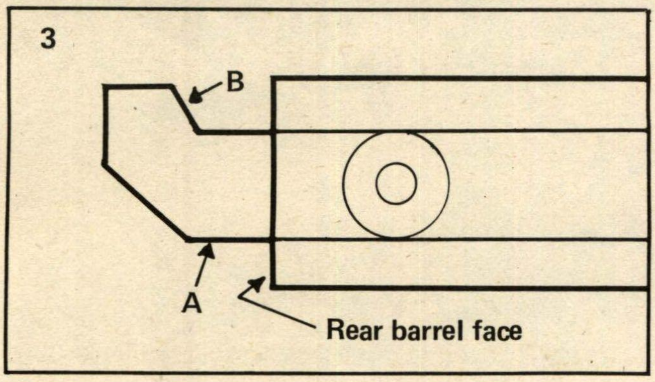
*Point of pencil indicates slight hairline gap allowed to remain between parts to permit final wearing in and fitting.*



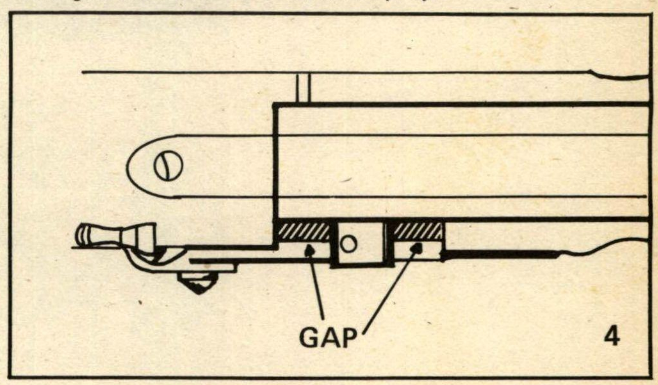



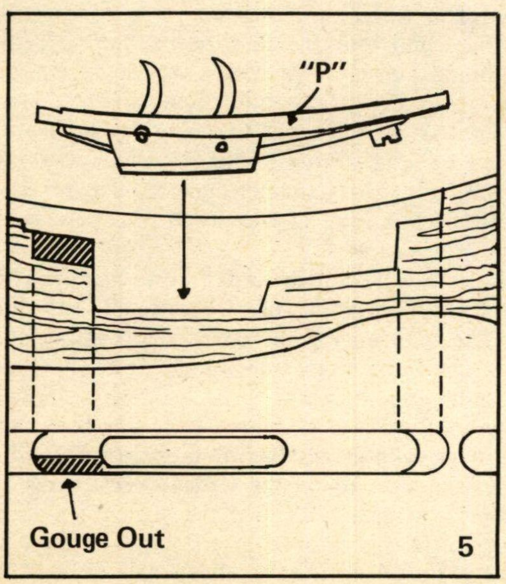

*First step to fitting butt plate "E" to stock is to place on stock and carefully remove wood from flat area until plate aligns with lower portion. Recess for toe plate "T," above, is cut with square or rectangular file.*

*Below, fitting tang to barrel requires extreme care. Carefully study interference points before filing any metal. Most filing will be done at points A and B.*

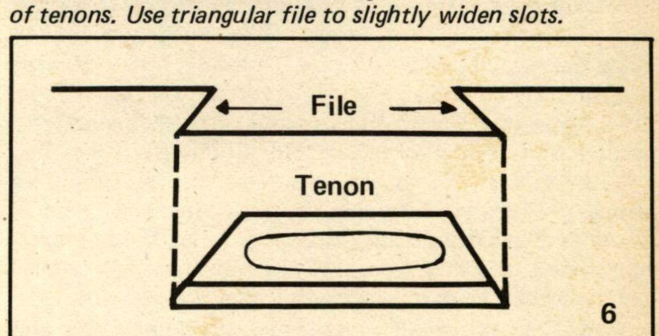



*Small gap between side flat of barrel and inside of lock, below, must be eliminated to prevent powder fouling. CVA instructions describe proper method.*

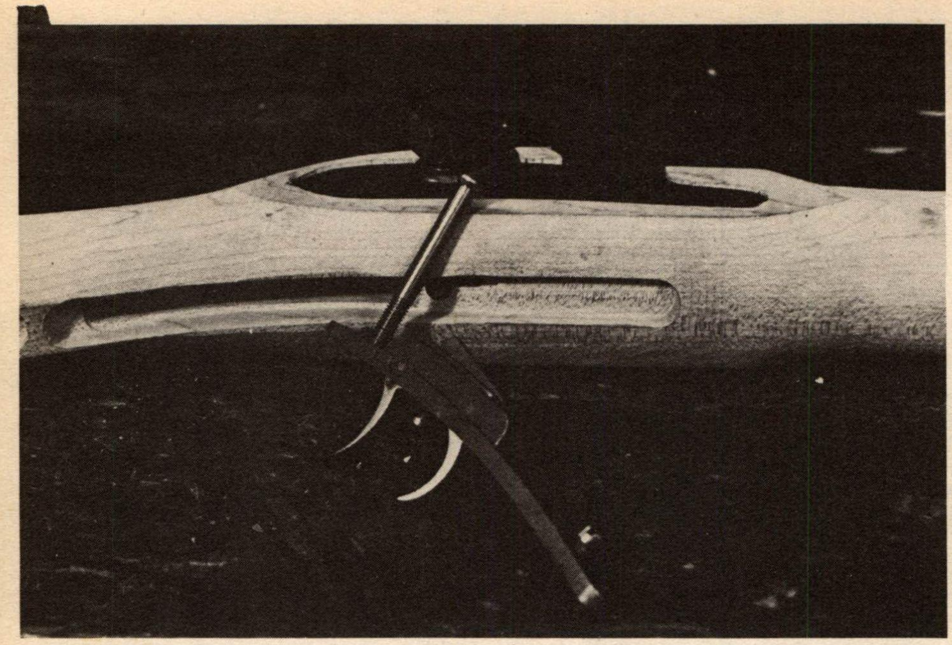


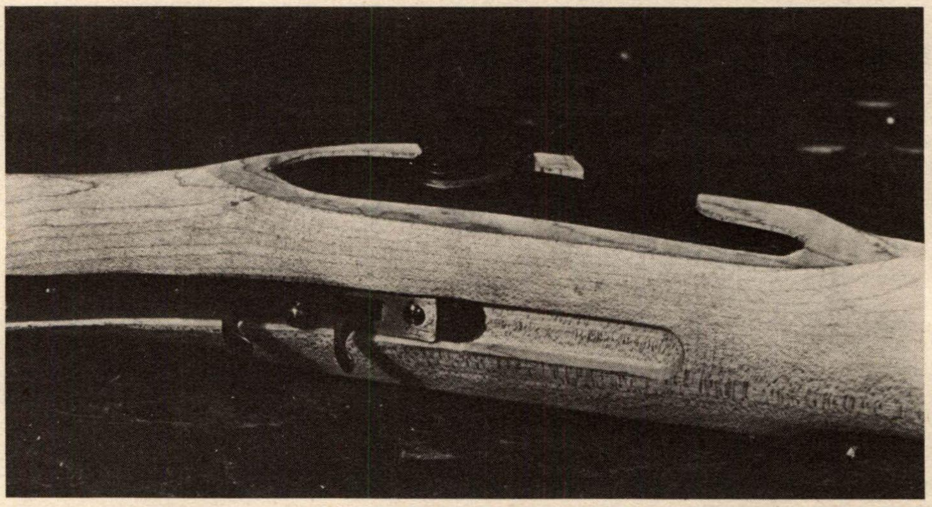

*Dovetail slots in bottom of barrel are pre-cut. Enough metal should be removed resulting in secure friction fit of tenons. Use triangular file to slightly widen slots.*




*Correct seating of trigger assembly, left, results in trigger plate "P" being flush with upper level of inletting. Wood must be removed as indicated.*



*Tang screw is test-threaded into trigger assembly before seating.*



*Trigger assembly, properly inletted and fitted to stock, is held in place by tang screw through stock.*

make room for the small spring wire on the trigger assembly.

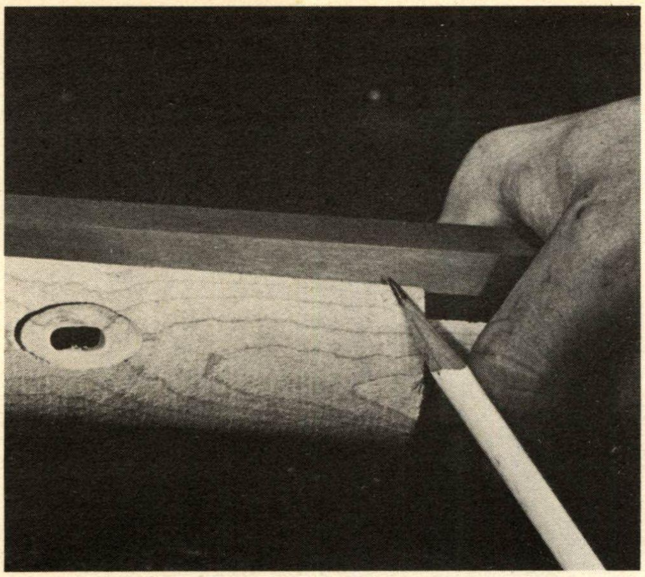
The next test is to check the function of trigger and lock as a unit. Hold the hammer spur with your left thumb to prevent it from snapping as you test the triggers. Cock the hammer and pull the front trigger. The sear should trip and allow the hammer to go forward. Do not forget to prevent the hammer from snapping. Now try the set-trigger function. Again, the sear should trip and allow the hammer to go forward – both worked perfectly on this kit. If they had not, the problem could have been corrected by simply inletting the trigger assembly deeper, removing a small amount of wood each time and performing the test function. Wood or metal, you always remove a small amount and test, then keep repeating until you achieve your goal.

With lock and trigger functioning, it is time to fully seat the barrel in its inletted channel. With the barrel in position, grasp barrel and forend and spring them together. Repeat several times. If necessary, go back and remove a small amount of metal to make the barrel plug and tang fit better.

It has always been my personal opinion that with a patent breech-type rifle, the barrel should not just plop into position. This leaves no allowance for normal wear. With the barrel fitted into the tang recess, the weight of the barrel should pull it down until a very small gap is left at the forend tip. Using only your thumb and forefinger, you should be able to fully seat the barrel in its channel with mild pressure. This assures a snug fit and allows for normal wear. Naturally, the barrel channel should be clean and level with no bumps or high spots to give a false reading of proper barrel seating.

With the barrel properly seated in its channel, it is time to install the two tenons in their dovetail slots under the barrel. The tenons are hollow, and the barrel wedges pass through them and both sides of the stock to secure the barrel to the forend.

As with all metal parts, check to be sure the wedges will pass through without binding. Remove any burrs of metal in the tenon slots or on the wedges. Next make a slight cleaning cut with a file across the bottom of the tenons until the surface is smooth. If you think of the tenons as dovetail sights, the fitting to the female dovetail slots in the barrel is exactly the same. Use a file to very lightly



*Gap between barrel and muzzle end of forend is a bit too much at pencil point. Tang and plug need fitting.*

bevel one side of the tenon until you have one side slightly narrower than the other side, just like a sight.

Now use a sight file at about a five-degree angle in the barrel dovetail. You will cut one side slightly wider than the opposite side to match your beveled tenon. It is good practice to use the same method as with sights. Have the muzzle pointed away from you and the tenon entering the barrel dovetail from the right. File a small amount to widen the barrel dovetail slot. Try pressing the tenon in with your thumb. When it will enter just short of halfway, stop filing and try seating by using a punch and light hammer blows.

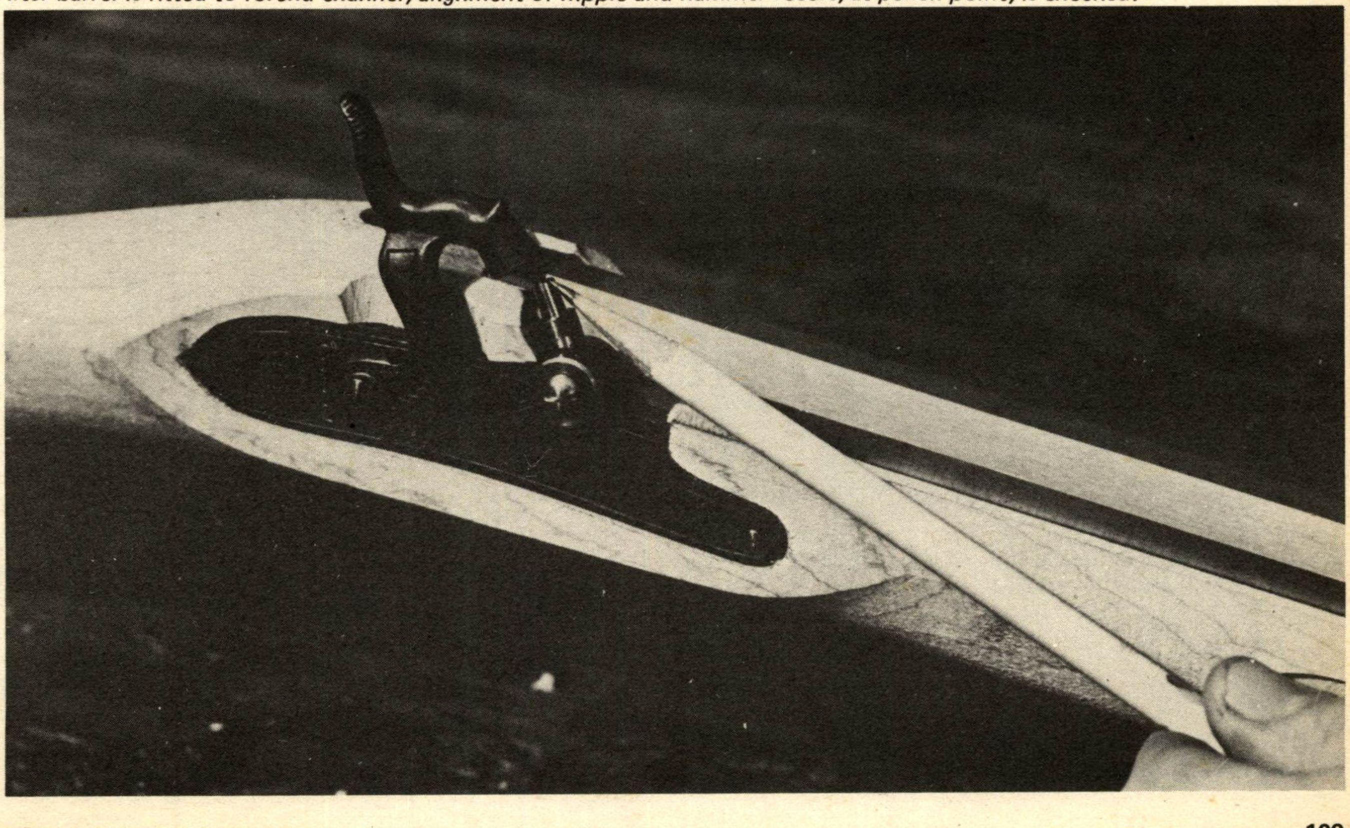
If it taps into center position, fine. If the barrel dovetail starts to pucker up on the edges, remove the tenon and file the center and left sides of the dovetail slot a wee bit wider. Go slow with your filing, usually only a couple of strokes with the file will be necessary. The tenon should tap into place firmly and securely. Now repeat the process with the other tenon.

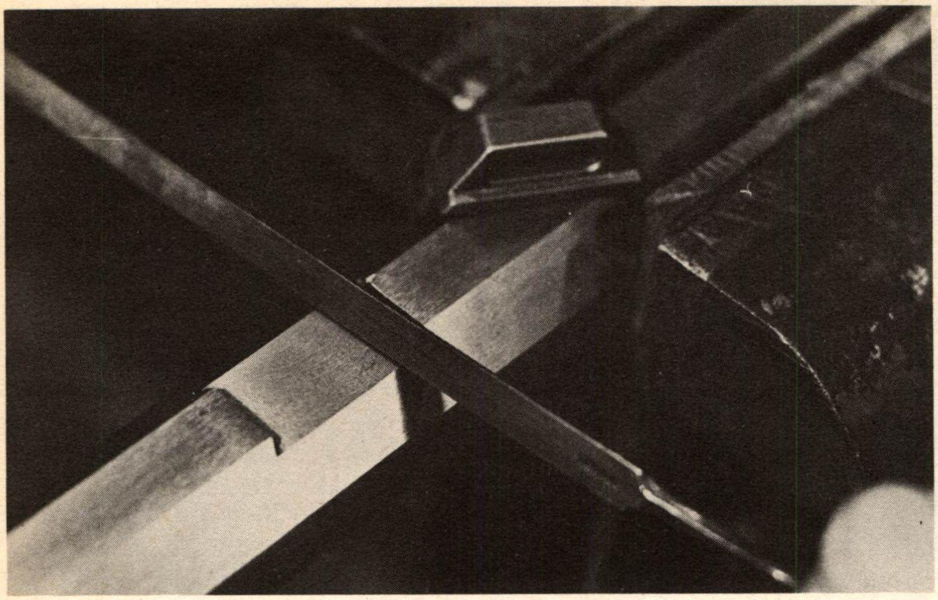
With the tenons in place, install the barrel and pull it down tightly with your fingers. If it will not seat, one or both tenons are hitting wood in the barrel channel. Even if the barrel seats fully, remove the barrel and check the tenon recesses. If you see any compressed wood, lightly remove a small amount of wood as the tenons should not touch the wood in the barrel channel.

Now press the barrel down until it is fully seated in its channel and hold it in this position. Insert a wedge through its precut hole in the stock from the right side. Use a wooden block or plastic-tip hammer to tap the wedge through the wood, through the tenon and through the left side of the forend. Let the wedge compress the wood. Use a file to cut the opening in the stock larger only if you meet heavy resistance. Naturally, if it is stopped by the tenon slot the slot must be filed a bit to allow it to pass through. It is important to obtain as tight a fit as possible, as only pressure holds the wedge in position when the gun is fully assembled. A sloppy fit will allow the wedge to fall out when the gun is used. Do not try to fully seat the wedge, as the German silver wedge plates have yet to be installed.

Next we install the pewter nose cap on the forend tip.

*After barrel is fitted to forend channel, alignment of nipple and hammer recess, at pencil point, is checked.*





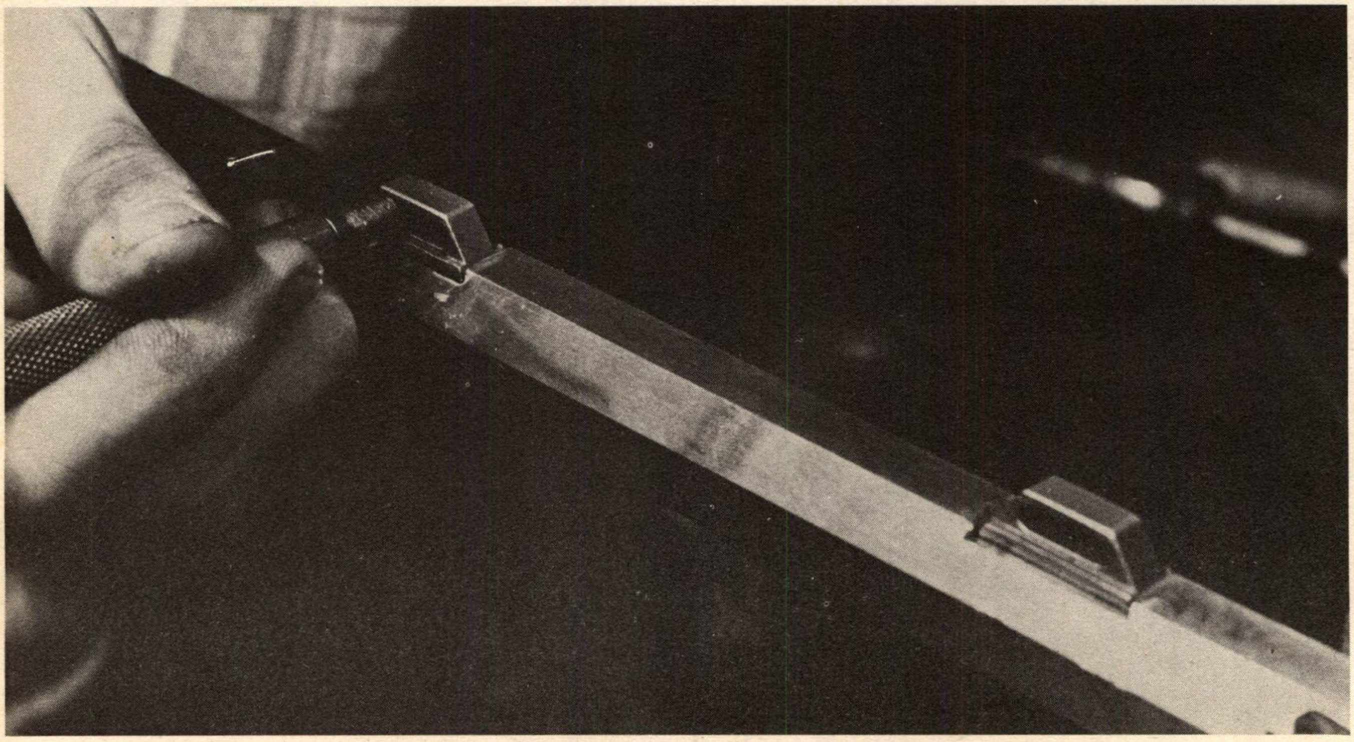
Tenon recess in barrel is cut with triangular file at slight angle to widen right side only. Text describes file-and-try method of enlarging recess.

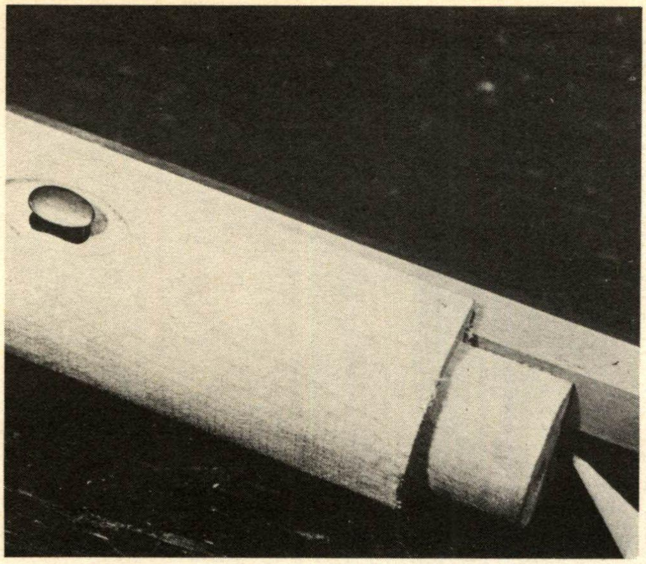
Line it up with the barrel channel and lightly tap it with a piece of wood or a plastic-tip hammer. Do not try to drive it to full depth. Remove the nose cap and you can easily see where it is compressing and marking the wood. Use only a wood scraper to remove light amounts of wood at the points that are binding. Reinstall the nose cap and lightly tap its solid end again. It will move further toward its seating. Remove the nose cap. Use a scraper again and repeat until it is fully seated. Do not install the two nose cap screws at this stage of assembly.

Closely examine the barrel rib that attaches to the underside of the barrel with three screws. The rounded end goes toward the muzzle while the squared end fits into a recess in the nose cap on the forend. Lay it in position on the underside of the barrel and check the alignment of the three threaded holes in the barrel. The two ramrod thimbles fit into a shallow groove in the bottom of the rib and are held in place by two screws inserted from the back of the rib and into pre-threaded holes in the thimbles. Install the screws, pulling them up tightly to secure the thimbles to the rib. Now slip the ramrod through the thimbles. The screws should not pass through the thimbles and obstruct the ramrod. If this occurs, remove the screws and file a little metal off the ends to shorten the length and eliminate the problem.

With thimbles properly in place, install the rib on the

*First tenon has been installed and centered and second tenon is being tapped in place with punch and light hammer.*





*Pencil points to tight fit of barrel and forend tip. Wedge has been tapped into place but not flush.*

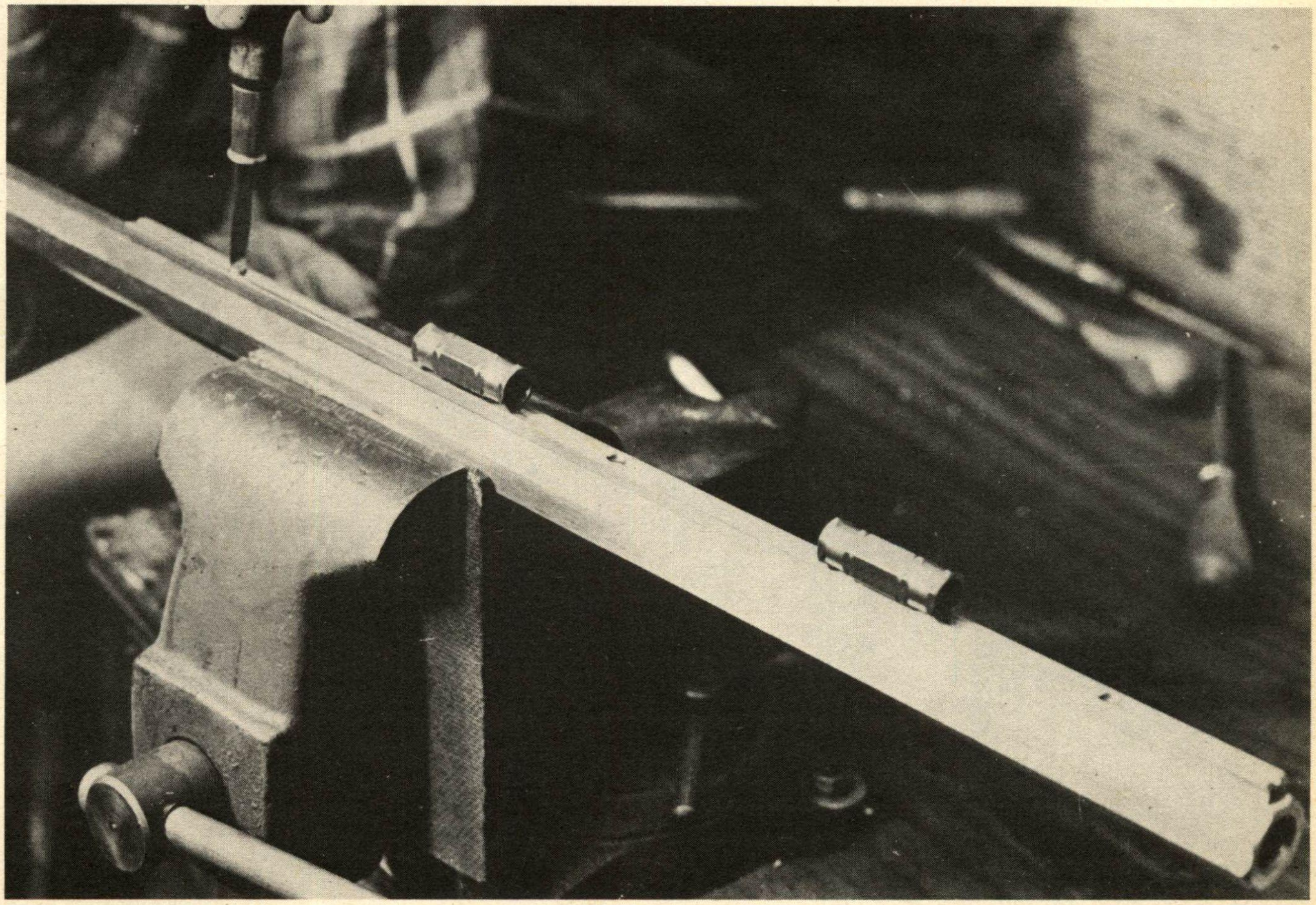
barrel. Pull the screws up medium tight. Now install the barrel, easing it down in place with the rib entering the nose cap recess for the rib. With the sample kit the rib was about one-sixteenth-inch too long. If this occurs, measure closely, remove the rib from the barrel and shorten the rear end by filing. Check your filing by holding the rib against the barrel, sliding it back into the nose cap recess and checking screw-hole alignment of rib and barrel. Do not shorten the rib more than necessary. Next reinstall the rib securely on the barrel. Finish by installing the two wood screws that secure the nose cap to the forend.

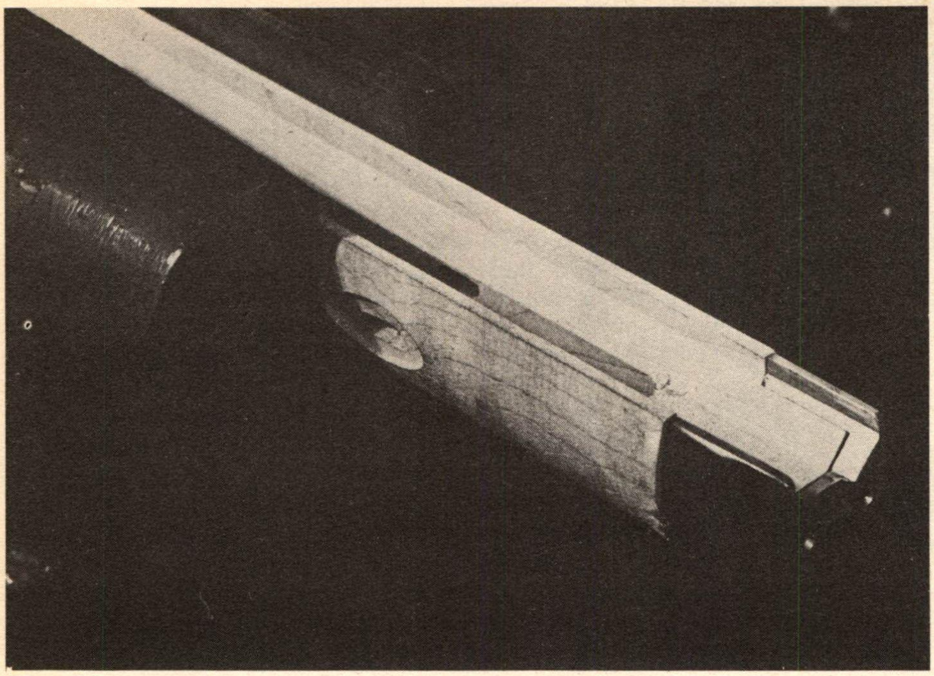
Install the German silver wedge plates on each side of the forend. This requires only the usual cleaning of the inletted recess with a small scraper. It may appear to be a nit-picking point, but align the wood screw slots to parallel the length of the stock. If you have ever closely examined a realy quality firearm, you will always find the screws aligned in this manner. Butt plate and other screw slots are aligned lengthwise the butt plate. To me, a screw left at some odd angle stands out like a sore thumb. Check the fit of the barrel wedges with the plates in position. The wedges should be a firm, snug pressure fit.

The steel trigger guard fits into its inletted position with no problem. As usual, the bottom of the trigger guard, like all components, was lightly filed to remove a few burrs and rough spots before fitting. The wood inletting recess also was given the standard cleaning with the flat-end scraper These light cleaning operations soon became a good habit in assembling any kit.

The next step is extremely important. Cock the hammer,

*With ramrod thimbles installed, barrel rib is temporarily assembled on barrel to check nose cap and forend fit.*





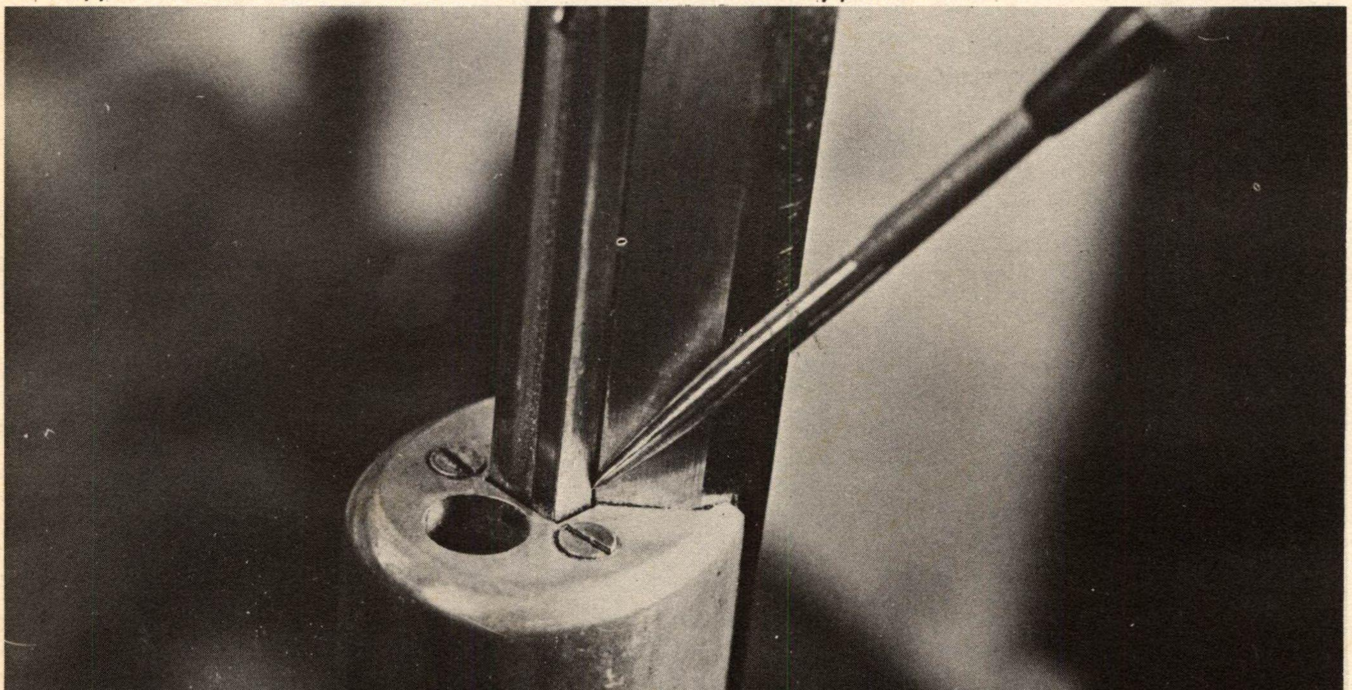
Nose cap fitted to forend.

trip the sear and slowly ease it down on the nipple. The cavity in the hammer nose should touch the nipple in the exact center of the hammer nose cavity. If it is not centered, the gun may misfire. Check this several times before arriving at a final conclusion.

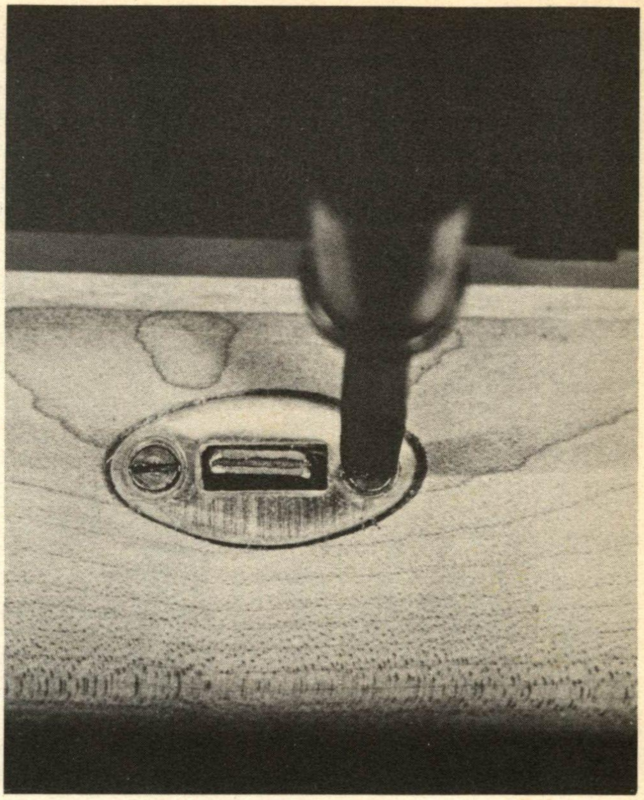
On this specific kit, the nipple was striking too far to the lock side. The lock plate was removed and the inletting deepened to bring the lock closer to the barrel. This, in turn, moved the hammer cavity and nipple end closer to the center. Two cut-and-try attempts were required to correctly center the nipple in the hammer nose cavity. Remember in similar cases to always remove just a small amount of wood each time and then reinstall the lock and check your progress. A correct fit with one big gouge of wood or metal is pure luck! Go slow and check your progress. This way no luck is involved, only true craftsmanship!

If the nipple strikes the cavity on the outside away from the lock, to the rear or too far forward, the only solution is

Nose cap, barrel and barrel rib should fit with close tolerances as indicated by pointer at rib.



*Close fit inletting and screw slots aligned parallel to length of barrel, add extra touch of quality workmanship to German silver wedge plate.*

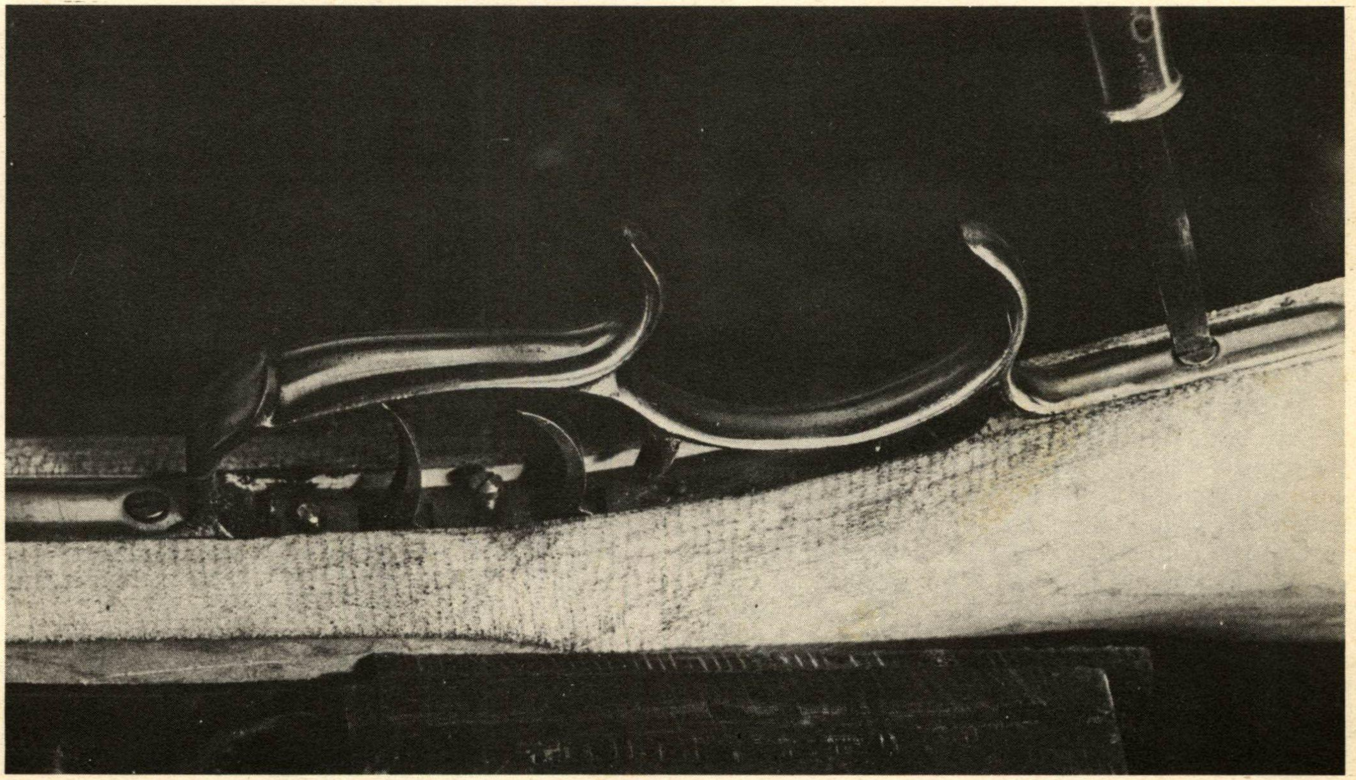


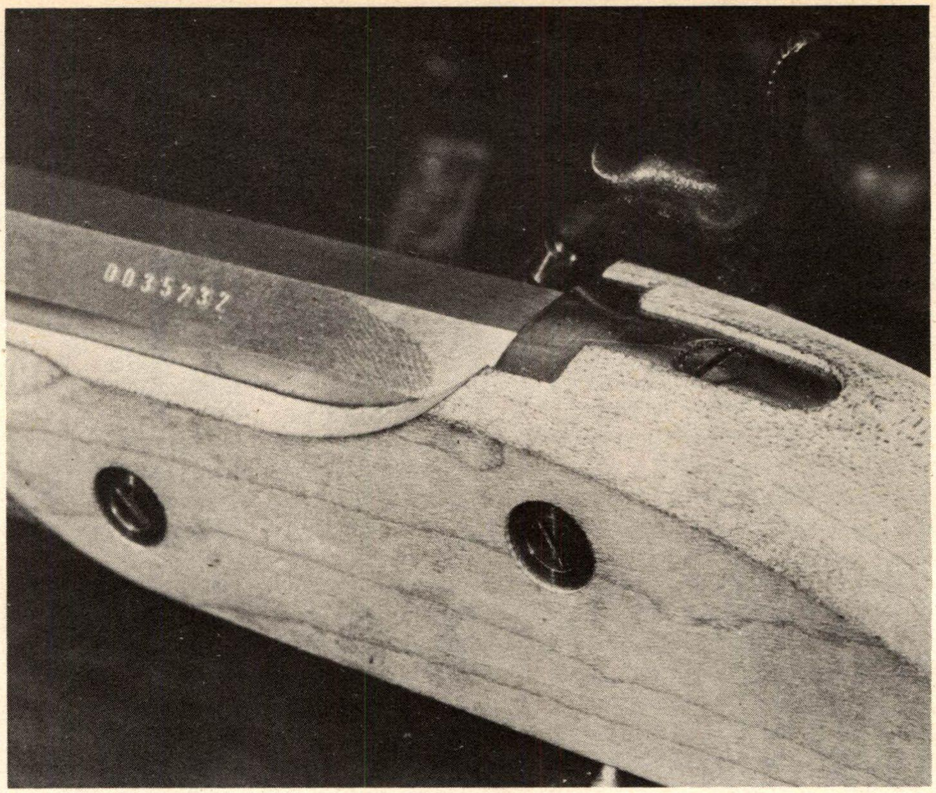
to alter the hammer. Again, check several times until you are one hundred percent sure of the direction and amount. Light a propane torch, adjust the flame and stand it on your bench. Remove the hammer from the lock, hold it with a pair of pliers and heat the hammer neck cherry red. Using a second pair of pliers, bend the hammer to the desired angle. Do not quench the hammer in oil or water! Allow it to cool in its own time. When cool, reassemble the hammer to the lock; if you measured correctly, it will center on the nipple. If not, reheat and try again. This is seldom necessary and is explained only in the event that it occurs.

As a side note, if you select a beverage can slightly larger in diameter than your propane torch and a piece of scrap wood about six inches square, you can make a very useful tool. Cut the top out of the can on the kitchen can opener, but leave the bottom untouched. Now punch a hole in the center of the bottom of the can. Set the can on the scrap of wood and secure it to the wood with a screw. Now anytime you need the torch to set on the bench, just use your homemade job with torch bottom setting in the can. The can and board prevent the torch from tipping over and you have both hands free.

The German silver patch box is pre-assembled and the stock closely inletted to match. As usual, clean the metal surface on the bottom of the lock plate, and the inletted wood recess. With the sample kit, no extra inletting was necessary. Hold the patch box in place with your fingertips and check to be sure no wood is preventing its correct operation of opening and closing. If necessary, cut away any wood causing it to bind or fail to fully open and close.

*Steel trigger guard has been cleaned of burrs and inletted recess scraped clean of wood slivers before installation.*





*This is how left rear of rifle should look. Slight amount of stock wood overhang will be removed during final finishing.*

Install the wood screws, line up the screw slots parallel to the length of the stock for that extra touch of quality.

The steel butt assembly consists of two major components: butt plate and toe plate. The butt plate is fitted to the stock first. The stock is contoured to closely match the curved butt plate, and you want to remember that only slight modification of the lines will be necessary to achieve a good fit. Hold the butt plate against the contour while exerting pressure with your fingertips down on the top extension. Now note whether the butt plate pivots to one side or remains straight up and down. If it pivots to the right, then the top inletted flat is too high on the right side. With a rasp, remove a little wood on the right edge.

Try the butt plate back in position. It should be less out of line. Go slow, removing just a small amount of wood each time. It usually requires only two or three trials before the butt plate is in centerline with the stock. Naturally, if the butt plate bottom pivots to the left, the left side of the top inletting would be too high. Once the butt plate is centered you are ready to move it forward toward the muzzle for a close fit.

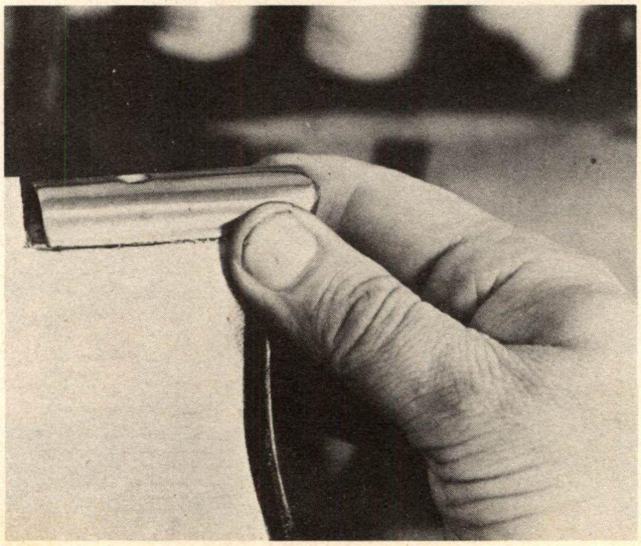
Do not forget to run your file over the inside edges of the butt plate to remove burrs and rough spots. Next coat the edges of the butt plate with inletting black. The most common mistake in fitting a curved butt plate, especially one with an inside recess such as this one, is trying to make the wood fit both the edges and the inside recess. It can be done, of course, but the end result is not necessary and serves no practical purpose. The key is to obtain a close fit of wood and metal only on all edges of the butt plate.

With the edges of the butt plate coated with a thin layer of inletting black, press the butt plate forward, evenly and hard. Remove the butt plate. The inletting black will have transferred to the wood where the metal made contact. The unmarked wood has not been touched by the metal and represents a gap.

Use the smooth, round end of a four-in-hand rasp to rasp away the marked wood. It is important that your strokes be from the outside edges toward the center only. If you try to cut from the inside out, you take a chance on splintering the stock edge. Rasp only enough to remove all traces of the marked wood, no more. Ignore the top flat you have already cut unless the butt plate starts to pivot to one side.

Redistribute the inletting black on the butt plate's edges and press it against the stock again. This time there should

*With edges of butt plate coated with inletting black, metal is pressed down and pushed forward with fingers to mark wood to be shaped and inletted for proper fit.*



be more marked wood and less left without a mark. This indicates that you are getting more metal and wood contact. Going back to the rasp, take fine strokes and remove only the marked wood in the form of wood dust. Redistribute the inletting black again and repeat the marking and rasping process.

After several sessions of cut and trial, the full edge of the curved butt plate will be marking the wood. This is a perfect fit. Now note the front of the top extension. It should be butted against the stock edge. If not, you will have to rasp the curved section of the stock until it does. Keep using the inletting black as a check method to be sure no gaps are left. In some cases, getting a fit of the curved section will require lightly rasping this vertical stop forward a small amount.

The perfect fit is when the curved section is marking the wood all the way around its edges, the top extension is snug against its stop, and the butt plate is on the centerline of the stock. It may sound difficult to achieve all of this fitting, but it is relatively simple if you will take your time and follow the slow, steady, small cut-and-try method.

Do not be concerned that the wood extends past the edges of the butt plate. It is purposely cut this way to help acheive a correct butt plate fit and the excess wood will be removed in final finishing of the stock.

Hold the butt plate firmly against the stock and use a nail, inserted through the screw holes in the butt plate, to mark the stock for the butt plate screw holes. Use a one-sixteenth-inch drill on the mark to drill for the screws. Place the butt plate back in position, insert and pull the two butt plate screws up tightly.

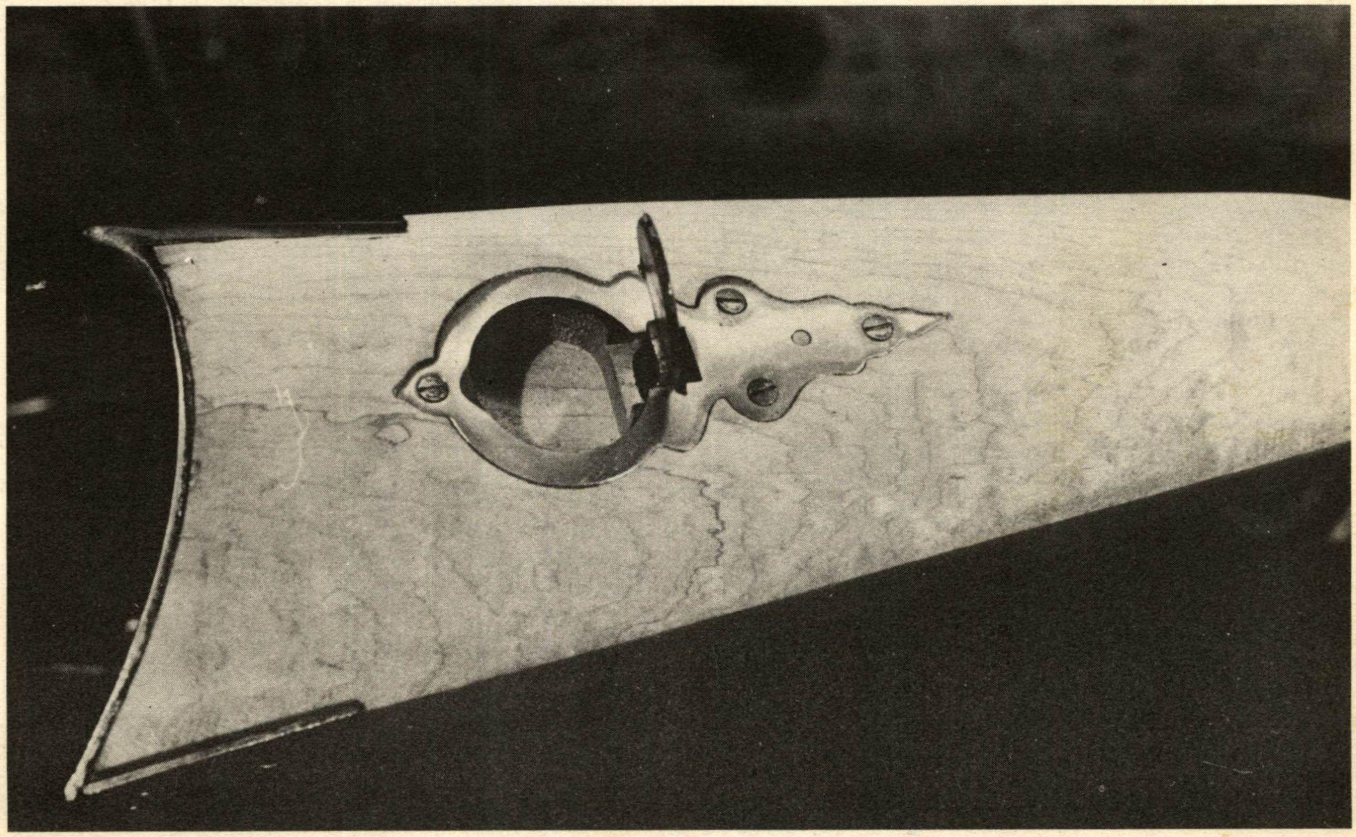
The most common point of stock damage is on the toe, and the muzzleloader is no exception. The best insurance against such damage is to use a metal bumper or protective toe plate. It was commonly used on the mountain or plains rifle, and is part of the CVA kit.

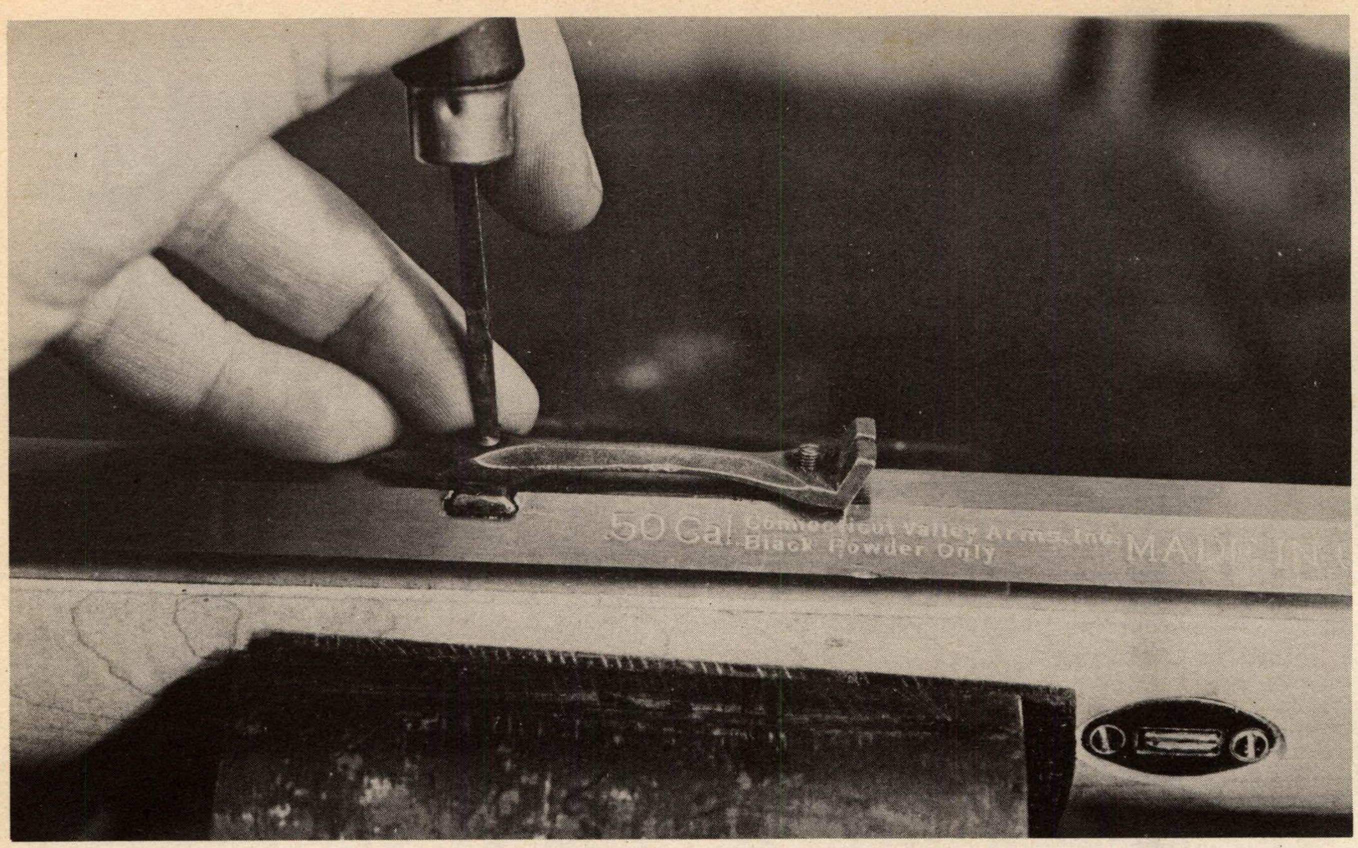
The toe plate has two screw holes located toward one end of the plate – the holes should be toward the muzzle. If you place them toward the butt plate, the wood will be too narrow at the toe for the screw to insert to full depth.

With a sharp, pointed scribe, using the flat pre-inletted section of the stock at the toe as a guide, scribe a line across the butt plate. With a file, cut a square notch in the metal butt plate to match the width and thickness of the toe plate. With the butt plate reinstalled, lay the toe plate in position with the end butted against the filed notch in the butt plate. The toe plate will be too long for the pre-inletted wood recess, so use a sharp pencil to mark across the end of the toe plate then using a file or chisel, lengthen the recess. Remember that you do not cut the marked line. The cut-and-trial method, with only a small amount of wood removed each time, will achieve the best results using the marked line only as a guide.

When the toe plate presses into position, mark the location of the two screw holes. Use a one-sixteenth-inch diameter drill to prepare holes for the screws. Install the screws, pulling them up tightly with the slots parallel to the length of the stock. There will be excess wood on each side

*Stock as it looks with butt plate, toe plate and patchbox properly installed. Note steel screws through German silver patchbox have been aligned lengthwise. If door does not open and close freely, remove additional wood.*






*Rear sight and rear sight dovetail slot must be cleaned up and smoothed before assembly. Fit is looser than that of tenons to allow rear sight to move left or right during adjustment. To right is elevation screw.*

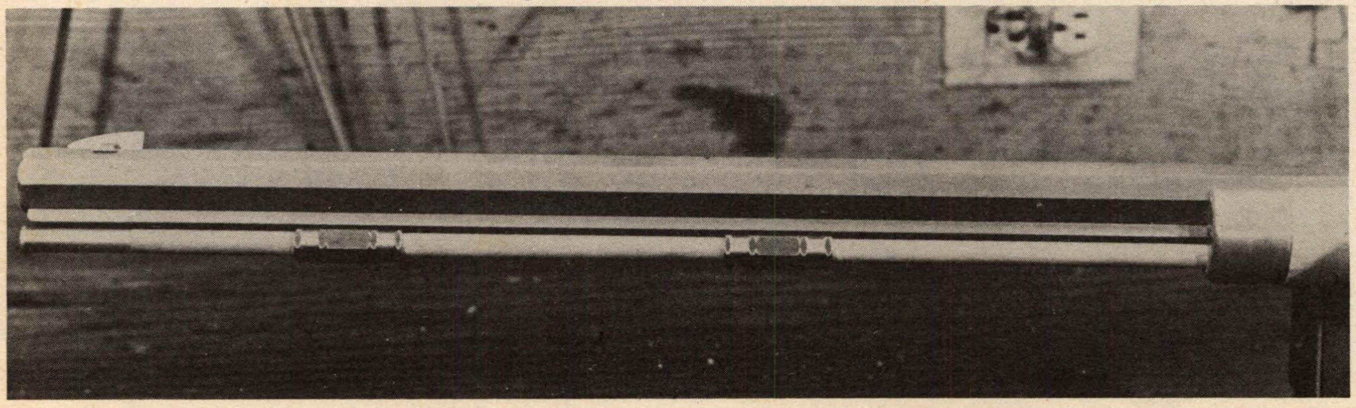
of the toe plate, but this will be cut back in the wood shaping and finishing.

The rear sight has two screws. The one directly over the male dovetail locks the sight in the barrel dovetail. The barrel dovetail should allow the sight to move from left to right for windage adjustment, with the lock screw pulled up tightly to hold the adjustment position. You need only to clean the sight dovetail and barrel dovetail of burrs and rough spots. The rear screw next to the sight blade is for elevation adjustment. Both screws should not protrude when you install the sight on the barrel. When centered, lock the sight in position with the front screw and with just enough pressure on the elevation screw to prevent it from falling out. Final adjustment is made in test firing.

The front sight is composed of a steel dovetail base and a German silver blade, locked together as a unit. It already is closely shaped to match the equally close sight dovetail in the barrel. With the sample kit, only a light clean up to remove a few rough spots was necessary. Remember that the sight goes in from the right side with the angle of the sight blade toward the muzzle.

The lock on the CVA kit has two interesting and useful features. With any set trigger there should be what is known as a fly in the lock mechanism. When the lock is cocked and

*Assembled forward section of rifle shows front sight blade slopes toward muzzle; ramrod snugly in position.*



the set trigger touched, a spring flips up the trigger blade, striking the sear bar and tripping the sear engagement out of the hammer sear notch. However, the trigger blade does not exert enough pressure to hold the sear bar out of engagement with the lock. The hammer will be halted in its fall by the sear engaging the half-cock notch in the hammer, if a fly is not present.

The fly drops down and, being larger than the hammer bottom arc, the sear rides over and passes the half-cock notch. The flys in most locks depend on gravity or their size to make them function. The CVA has an extra precaution feature in the form of a small spring to automatically push the fly into position just before the sear engages the hammer full-cock notch. When the lock is to be put into half-cock by pulling the hammer back; it should easily allow the half-cock notch to be utilized. As you pull the hammer back to almost full cock, you should see the fly snap into position and hear a small click sound.

The second feature is a sear engagement screw, which is located just above the sear with a spring around the screw to hold the setting. Its purpose is to allow full sear and sear-notch engagement, but prevent excess engagement that serves no practical purpose. Turning the screw in limits sear and sear-notch engagement. Do not adjust the screw too much as you will not have full and safe sear to sear-notch engagement.

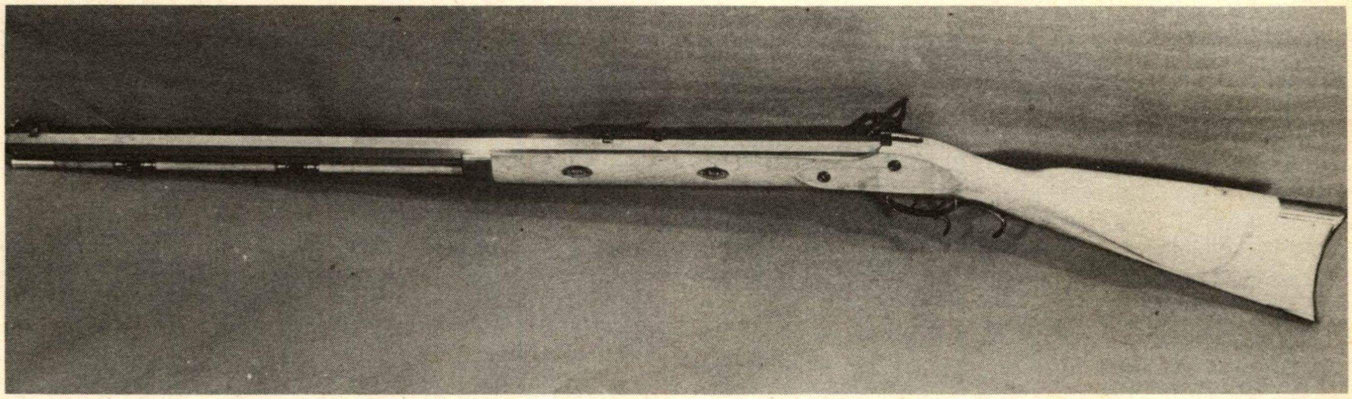
With the lock adjusted, next adjust the set triggers. All lock screws and such should be tight. Back the set-trigger adjustment screw out until the trigger will not set. Take two complete turns on the set-trigger adjustment screw. The triggers should now set and function. Do not try for a hair-trigger adjustment. A rule of thumb adjustment is, with triggers set and the hammers cocked, you should be able to bump the butt plate on the bench from a six-inch fall and the set triggers should not trip.

The kit is now assembled and ready for test firing to assure function. If the test is good, you can proceed with the wood and metal finishing.

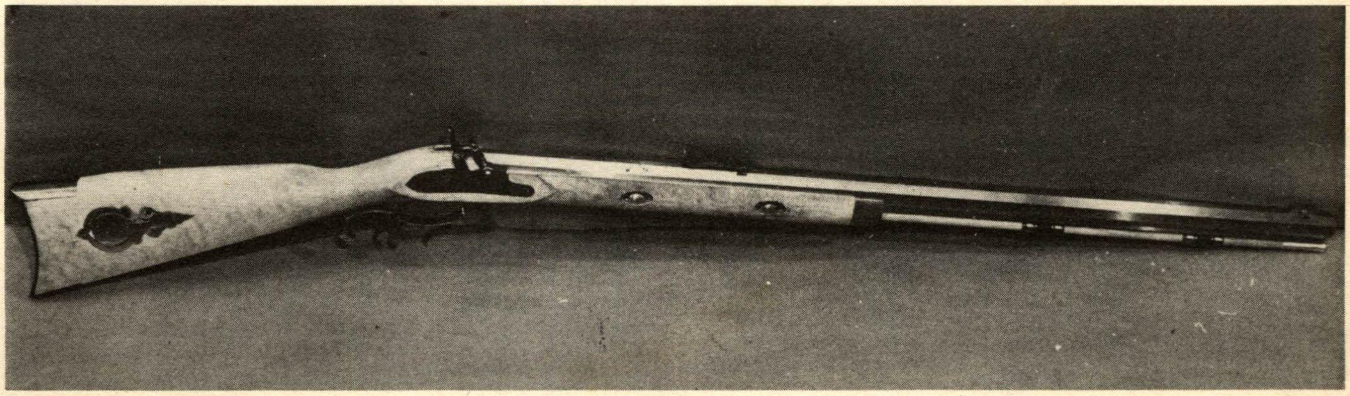
An interesting side note was involved with this kit. Several years ago, a young boy still in high school asked for any part-time job available. I hired him as a part-time clerk in the shipping department. By the time he finished high school, he was moved up to full-time and finally head of the shipping department. When not busy with his job, he was always back with the gunsmiths watching every move. To make a long story short, he is now in our gunsmith training program.

Bobby Nance is a black powder buff supreme. So when I started the CVA Mountain rifle kit, he asked if he could watch and learn. This was on his own, free time. Anyone wanting to learn this much has to be encouraged. I not only agreed, but gave him the kit with the understanding that he would follow my instructions and put his best effort in the job. The end result is a precision-assembled rifle that anyone would be proud to own.

Many people are a little afraid to tackle the assembly of a kit of this quality, but CVA has produced a kit that anyone can assemble. It has just enough latitude so that, with a little patience and determination, anyone can not only assemble but incorporate their own ideas in it; and, as a result, have a precision rifle they will treasure and enjoy.



*Left and right side views of completely assembled rifle ready for test firing and final wood fitting, finishing.*



CHAPTER 9

# WOOD SHAPING AND FINISHING

## Gun Stock Hardwoods And How To Bring Out The Best In Them

THERE IS AN ancient joke that it is very easy to make a gun stock. You just select a piece of wood and then cut away the part you do not want. It was no joke to the early gunsmiths, for that is exactly what they were forced to do. Some even had to cut the tree!

The machine-inletted stock blank dates back to 1820 and a little-known gunsmith by the name of Blanchard in Connecticut. Oddly enough, the machine-inletted gun stock was seldom used by gunsmiths until well over one hundred years later. Most preferred to start from a basic blank of wood. My own early training was with this type of stock making.

Today, you seldom find this method used for a variety of reasons, primarily financial. Although I welcome the wide range of available semi-inletted stocks and do not hesitate to utilize them, I do feel that any true, professional gunsmith should make at least one stock from scratch. The reason and purpose can be summed up in one word: patience!

There are over 1400 different known woods in the world and probably a few that are not known. Each differs in weight, grain structure and other specifications. The ones used on gunstocks, to any degree, can be counted on your fingers. The most widely used gunstock woods can be counted on the fingers of one hand. They have one thing in common: they are hardwood falling within a weight range of thirty-seven to fifty pounds per cubic foot in the dry state.

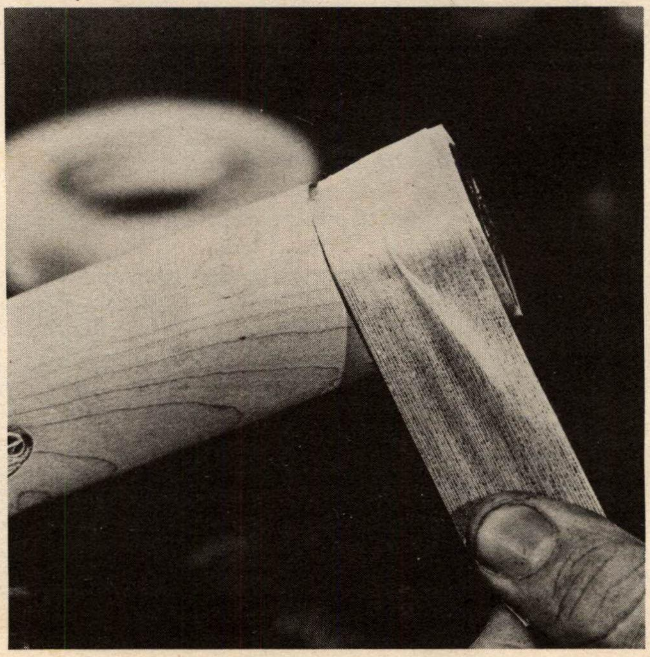
The United States has always been blessed with abundant native wood in this category, and the early gunsmiths did not fail to take full advantage of this fact. The most popular early wood was maple, specifically hard maple with good grain structure and figure. This strong, close grain, white colored wood was the first choice, as it accepted stain well and was easily finished.

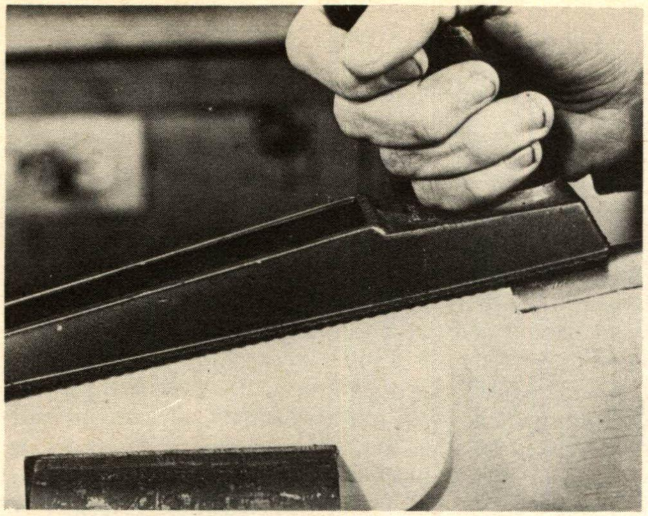
Beech, cherry, pecan and similar woods also had their followers, as each had a tone and texture that could not be matched by staining. In the beginning, walnut was on the bottom of the list, but slowly grew in popularity until today it is the number one choice.

Even if you select one type of wood, such as walnut, there is one key factor that should always be remembered during shaping, preparation and finishing. Wood is a product of nature and no two pieces of walnut will be identical. True, they may be similar in many ways, but never identical. Consequently, each stock must be closely studied if the maximum is to be achieved in bringing out its best qualities.

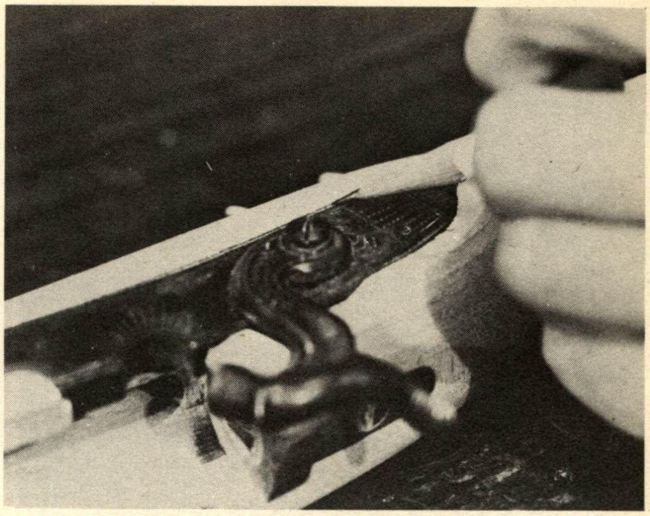
Actually, the wood should be closely studied even

*In preparation for sanding, plastic filament tape can be used to effectively mask (shield) the pewter nose cap on the forend of the CVA rifle stock.*





*The surform plane is used to shape the comb of the stock. Note that the steel butt plate has been removed to preclude marring during planing process.*



*A sharp lead pencil marks around the edges of the lock plate. The marked wood will be removed in the shaping and sanding processes.*

before the metal components are assembled. If the wood is dense and close grained, more pressure must be applied to wood scrapers and chisels. The metal parts, when pressed against the wood, will compress the wood very little; hence, you probably will have to use more than the normal amount of inletting black. On the other hand, if the wood is soft and porous, the opposite will be true. Light pressure must be used on the wood scraper to avoid splintering the wood. Metal pressed against it will compress the wood and mark it sufficiently to eliminate the continuous need of inletting black.

These are just a few examples of what a close examination of the wood will reveal, and how it must be handled. Few people ever take the time to examine a piece of wood or a stock blank with a magnifying glass. Try it and you will be surprised at what you will see.

These are mechanical factors about your stock. They will be important in the shaping, preparation and application of the finish to the wood. With this knowledge, you are better equipped to make decisions that will affect the final appearance of your stock.

Next examine the grain of the wood. In a good stock it should be as parallel to the length of the stock as nature will permit. The average stock received in a kit will give a false impression of its beauty before the finish is applied. For a sneak preview, lightly dampen the stock with a moist cloth and the beauty of the wood can be seen.

Remember what you have seen, for in the shaping operation you may decide to take advantage of the excess wood and slightly alter the shape of the lines of the stock. The purpose of the slight alteration is to draw more attention to the beauty of the wood while you decrease attention to some stock shape that would otherwise catch the eye.

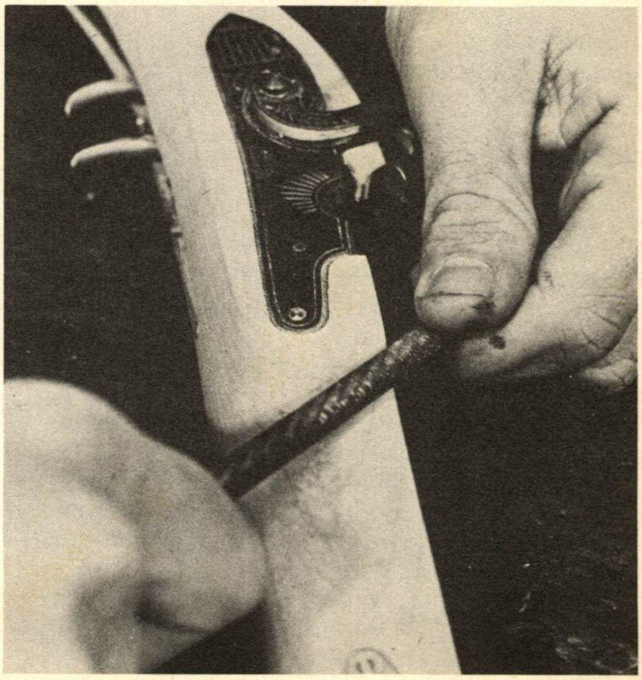
The second reason for remembering this sneak preview is that it will play an important part in the staining operation. In summation, you want to retain and amplify the natural beauty features of the wood.

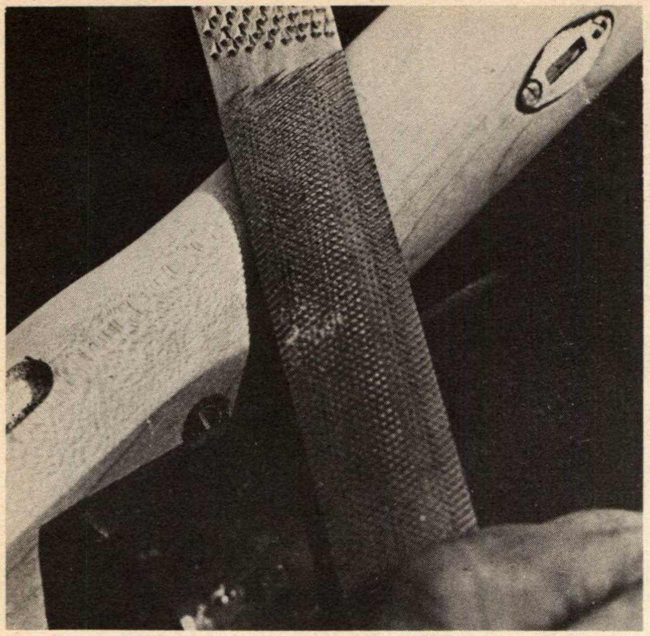
The purpose of constructing a gun from a kit is first to enjoy the work, second to add personal touches that make it a one-of-a-kind, and third to produce a gun superior in craftsmanship to a factory version. It is not that a factory does not know how to perform these operations, it is that they simply cannot pay a craftsman for lengthy time-consuming handwork and still compete in price with other factories.

The semi-inletted stock you receive with a kit has eliminated all of the really hard work in stock making. You have just enough wood remaining to incorporate your own ideas and bring out the best in the wood. Don't throw this opportunity away in a mad dash to complete the gun between dinner and dessert. Take your time, go slow and enjoy the opportunity.

When the kit has been fully assembled, test fired to

*A round file retains the "shield" around the lock plate so it won't be lost during shaping.*





*The four-in-hand wood rasp shapes and contours.*

assure correct function and cleaned, you are ready to start shaping the stock. Individual kits will require slight variations of procedure, but do not forget that the shaping will affect the overall appearance of the finished gun. While individual variations may be incorporated in the shaping, the basic fundamental lines of the stock must be retained.

As a general rule, the barrel is removed from the stock. This lightens the weight and makes the stock easier to handle. During the shaping phase, it is a good idea to reinstall the barrel periodically to see how your shaping operation is affecting the overall appearance. This also helps to ensure you are not removing too much wood in such areas as the comb or grip that would affect the feel and pointing ability of the completed gun.

The lock on most kits comes finished, and usually color case-hardened. As you will not be applying metal finish to the lock plate, scratches are to be avoided. You have two choices. One is to use a sharp pencil point to draw around the lock plate, marking the excess wood to be removed. The lock also should be periodically replaced to check your progress. The second method is to allow the lock to remain in place and very carefully use a scraper and metal file to remove the excess wood to the point of almost touching the lock plate. Extreme care must be used if this choice is utilized.

If at all possible, the other metal parts should remain on the stock. The reason for this is quite simple. There is a danger that in shaping the stock too much wood will be removed and leave the metal surface higher than the surrounding wood surface. If a choice has to be made, the wood surface should be a hair line higher than the metal surface. The perfect combination is to have both surfaces equal.

One solution is to mask the metal surface with a layer of tape, thus providing a protective shield for the metal. The best choice of tape is the plastic filament type commonly used in packing. The next choice is regular plastic electrician's tape. As the initial shaping will be accomplished using rough rasps, two protective tape layers provide added insurance. In final sanding, remove one of the layers of tape for a closer fit.

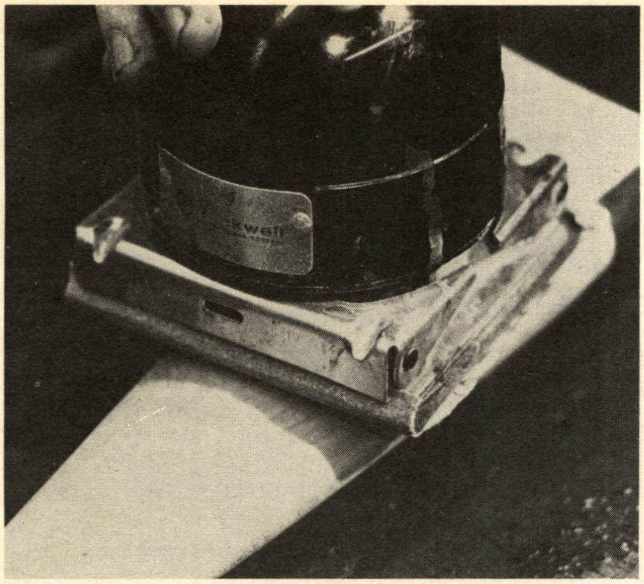
Portions of the stock metal, such as a steel butt plate, can be left unprotected. As the steel later will be blued or browned with prior polishing, you can actually do a better job if you shape and sand the steel and wood as one unit. Final sanding is always done with fine grit paper and scratches can be removed. Actually, in most cases you have to be careful to protect the shaping tool rather than the metal part.

German silver is a tough metal. Its usual composition does not contain silver, but does contain a healthy percent of steel and nickel plus zinc and copper. It resists scratching well, and can be brought back to a high luster with light polishing. This does not mean it cannot be scratched deeply by careless handling, but usually you can sand right over it without a protective plastic tape covering.

Brass is another matter, as it varies widely in alloy composition and hardness. Cast brass usually has a high copper content, usually about twenty percent, plus tin and zinc. Rolled brass, as found in sheets, has an even higher copper content. The one to watch out for is common yellow brass, as it has lead as one of its alloys. The best way to test its toughness is to lightly scrape the back of a piece or two. As a rule of thumb, play it safe and use a protective layer of tape. Pewter is basically a tin alloy and fairly easy to scratch, so it should be protected with tape.

With the decision made on how to protect the metal components on the stock, the next order of business is rough shaping. The surform plane and four-in-hand wood rasps are the basic tools. After you have gained a little experience you can add other wood rasps of various shapes. Right now metal files can be used. They do not remove much wood at each stroke, and this helps prevent too much

*The correct method of using sandpaper is with a solid wood backing rather than the hand.*



*Power sanding, as with this Rockwell, should only be attempted after gaining much hand-sanding experience.*

wood removal too quickly. A file card cleaner is used to clear the file teeth quickly as they become clogged with wood.

The first point to be shaped on a rifle stock is the top. Use the surform plane to bring the wood down slowly. Hold the rifle to your cheek in shooting position with the barrel in place. If you have to press your cheek down hard to see the sights, the comb – the place your cheek touches – is too high and more wood must be removed. It's the old cut-and-try method.

Most people will say a stock has too much or not enough drop at the heel of the stock, the top of the butt plate. Actually, the amount of drop at the comb is twice as important. Drop is the distance from a straight-edge ruler touching both of the sights and extending past the butt plate down to the stock. This measurement is drop at comb and drop at heel.

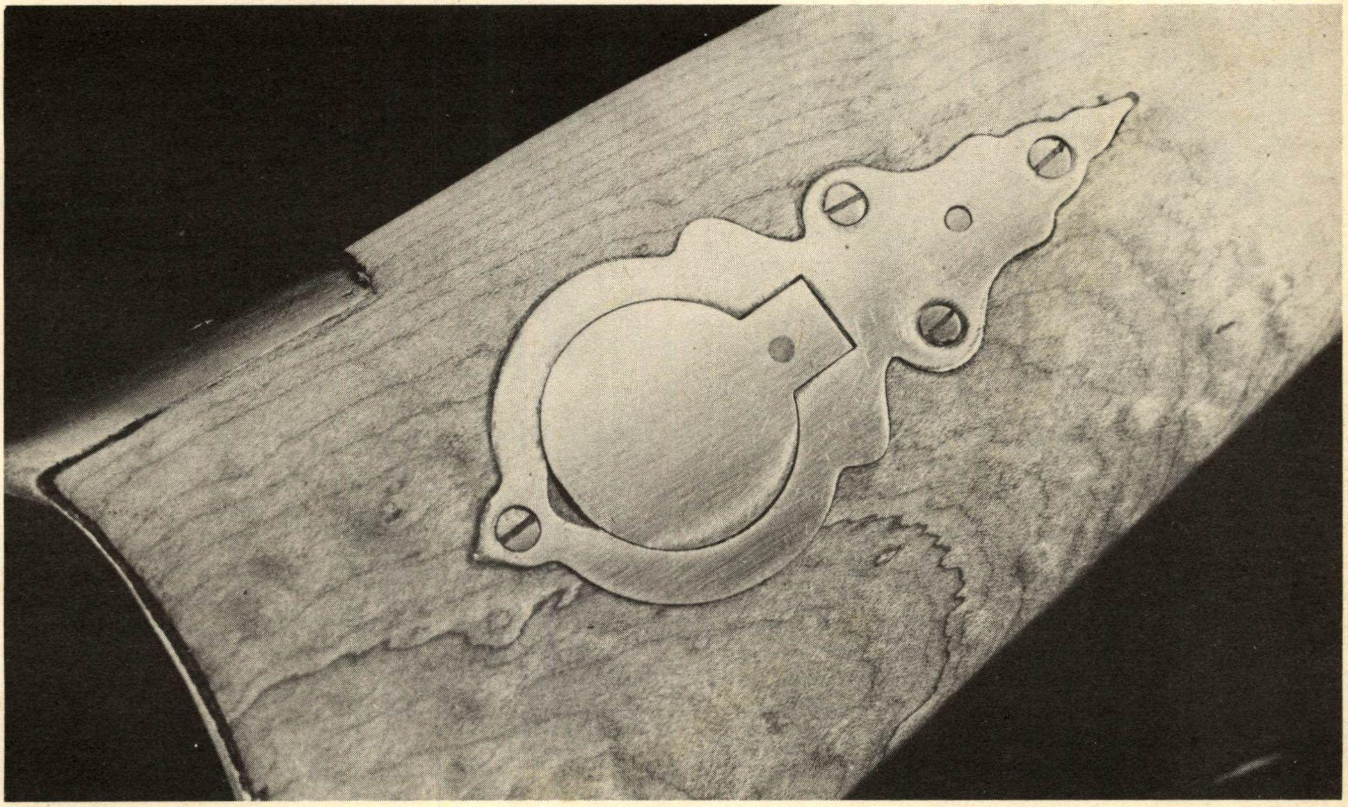
The best way I can explain the correct amount of wood to remove is for you to make the following test. With the barrel installed, aim at a target. Now lower the gun and close your eyes. Bring the gun up to your shoulder naturally and then open your eyes. If the sights are lined up level you have a perfect drop at comb. If you have to press your cheek down to see the sights, more wood must be removed at the comb using a plane.

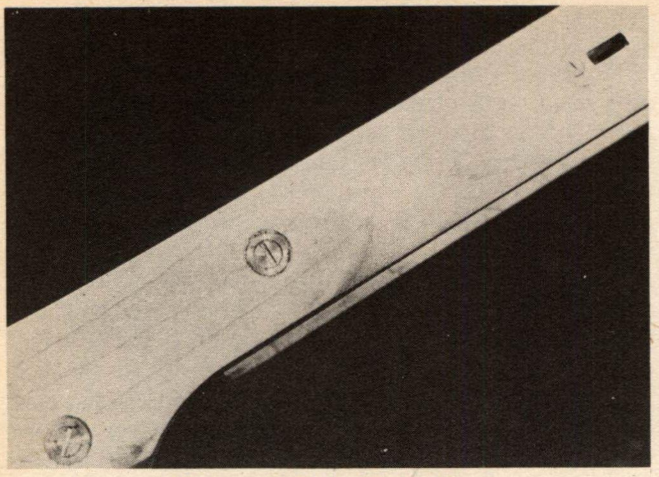
When you have the correct comb drop, level off the rest of the top of the stock until the wood and metal at the butt plate heel match. Do not plane a flat surface on top of the stock; instead, keep lightly rounding the edges.

If you have a single-shot pistol, the main thing is to remove or leave wood on the inside curve of the pistol grip until it feels comfortable. The same procedure should be used with the outside curve of the pistol grip, especially on the back.

Most single-shot rifles and pistols will have a raised surface, somewhat like a shield or plate, around the lock and the lock plate or washer on the opposite side of the stock. Before you start thinning the stock, take steps to retain these lines. Use a round file to make the raised portion more distinct. If you decide later that you want to

*The German silver patch box of the CVA rifle sanded in place without masking. The wood is not yet fully shaped and sanded around the steel butt plate.*





*The left side of the stock of the CVA rifle — the washers are left in place and are sanded with the stock as they will later be blued.*

decrease their importance in the stock shape to draw more attention to the wood grain, they can be sanded and blended into the rest of the wood. Always leave your options open in stock shaping, as you may later reverse your original decision.

Except for military reproductions, most factory muzzleloaders have too much excess wood. The original guns made by individual gunsmiths had a minimum amount of wood, but not to the point of sacrificing stock strength. Long, flowing, graceful lines combining wood and metal are easily seen in the original guns. This is your goal.

Use the surform plane and four-in-hand rasp to remove the remaining excess wood. Use the coarse teeth of the rasp as little as possible. The rasp and plane are set aside when you have the stock ninety percent shaped.

Now switch to metal files and use them to reduce the wood about five percent more. While you are doing this, carefully note all the scratches left by the rasp and plane. Use files to remove all of the scratches, and then set the files aside. The remaining five percent of excess wood is removed with sandpaper.

There are three basic rules in sanding a stock. First, always sand parallel or with the grain. Second, start with the smallest grit possible to get the job done and work to an ever-increasing finer grit as you near the finishing of your sanding. Third, always use some form of solid backing of the sandpaper. If you use your fingertips or the palm of your hand as a backing, you will sand unevenly, causing dips and curves in the wood surface.

Take your time in the sanding operation, as your patience and attention to detail will be quite obvious in the finished gun. I will not hesitate to use the Rockwell electric sander, but this does not mean that any details are skipped. The only difference is speed. Although the electric sander is faster, it also requires considerable skill. I would not recommend that anyone sand his first few stocks with a power sander. The first ones should be done by hand, as it is only through experience that you learn how much pressure is required, which grit of sandpaper to choose, how to sand in close places, and a dozen other important points.

As your sanding progresses to finer grits of sandpaper, you will learn a very important lesson. All the scratches you made with rasp, file and coarse grit sandpaper will stand out like a sore thumb. The ultimate goal is a smooth glass-like surface. The closer you come to this goal, the harder it will be to remove scratches. Next time you will take more time and avoid these scratches.

If you gave one-hundred people a stock to sand, eighty would stop too soon. Your sanding should retain the lines of the stock you have shaped, but it should blend these lines into a smooth finish from forend to butt plate. No gouge, frayed wood, scratch or blemish should be visible.

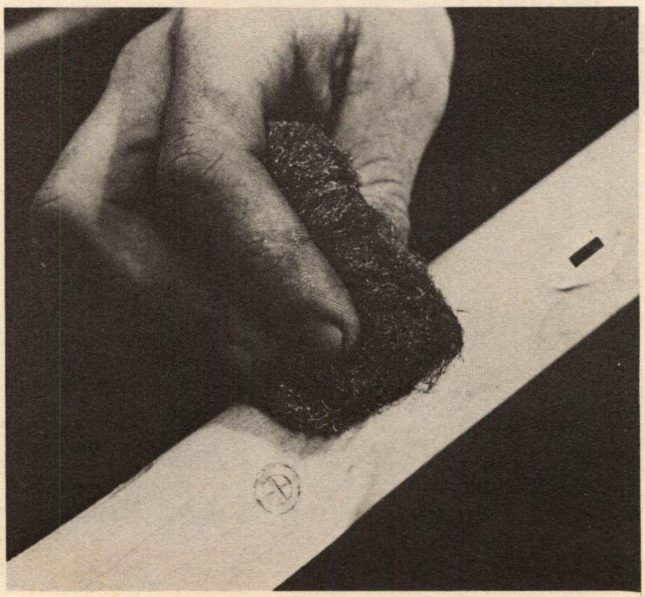
During the sanding, you will create wood dust which can be deceiving. Use an old bath towel to dust and wipe the stock periodically. When the surface is smooth from end to end, wipe the stock hard with your dust cloth. Closely inspect all of the surface. If a scratch is visible, sand it. Now, with a pad of four aught (0000) steel wool, rub the stock hard from one end to the other. Like sandpaper, your strokes must be with the grain and never across the grain.

The steel wool acts like ultra-fine sandpaper and a metal scraper combined. The wood will actually start to shine. This is due to the removal of tiny imperfections, and also because steel wool burnishes the wood. The finished stock will look like a piece of glass.

Now we come to a step that is often ignored: whiskering the stock. During the sanding and steel wool finishing, you pressed down the small ends of tiny slivers of wood. If you apply stock finish at this point, they will rise up and the stock surface will be fuzzy or like the stubble of whiskers before a man shaves.

So we remove them now before any finish is applied. It is actually the final step in sanding a stock. With a damp cloth, not soaking wet, moisten the wood all over. Do not give the wood a bath, just moisten it! Next, hold the wood about a foot above a heat source, like a kitchen-stove burner. You want to dry it as fast as possible, but don't let

*The sanding paper stage completed, the stock is being briskly sanded and burnished with 0000 steel wool for final removal of scratches, etc.*




*The sanding and whiskering of the CVA rifle is now complete and it's ready for staining. The CVA Olde Time Finishing Kit includes metal degreaser, bluer/wood stain and finish oil.*

the heat scorch the wood. As the wood dries, the moisture turns to steam and raises the wood whiskers.

Very lightly run your fingertips over the surface of the wood from the small end toward the larger end. You will feel the fuzzy whiskers on what you thought was your glass-like surface. Use a pad of four aught (0000) steel wool, pressing hard, to run from the small end of the wood toward the larger end. The steel wool will cut the fuzzy whiskers off. Never make a stroke from the larger end to the smaller end of a stock, as you will only press the fuzzy whiskers back down.

Whisker the stock twice, regardless of the grade or type of wood. Try a third time. This last time there should be no whiskers, but always make this check to be sure. On some very open-grain wood, I have found a few occasions when four whiskering steps were necessary.

If the stock is free of whiskers, make your last steel wool rubbing and you have done a good, thorough sanding job!

Beauty is in the eye of the beholder. The decision regarding the staining of a stock and to what degree is strictly a personal preference. Lighter woods such as maple and beech offer the widest choice, but all walnut except the very dark shades can be altered in tone and shade by staining. An odd piece of similar wood makes the best test sample. If none is available, use the inside of the lock inletted recess or barrel channel as a test area.

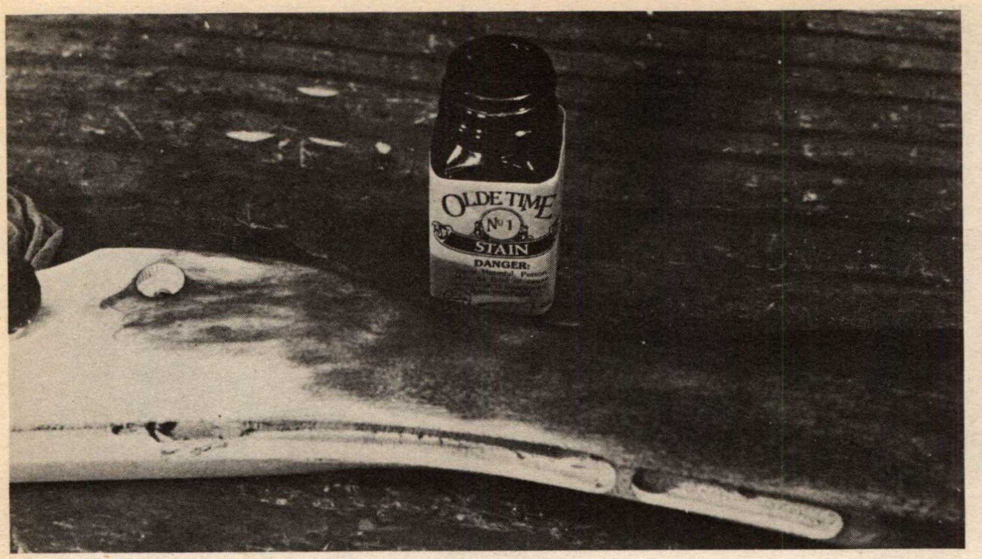
Early original stocks primarily were stained with the juice of berries, nuts and roots. Lamp black or soot were common darkening agents. Tobacco juice was sometimes used to give a golden tone. Thankfully, today we have a wide variety of stains designed for gun stocks to choose from or combine.

The best choice is a water-based stain, not one that has an oil base. Oil base stains are hard to control as to final shades, and many have a nasty habit of not diluting thoroughly. With water-base stains, read the manufacturer's instructions on how much water to use to dilute the stain, and then double the amount of water stated. This makes a weak stain, but gives you more control; if you want it darker, you just add another coat of stain! Try combining several types, such as cherry and oak or walnut, or all three.

Your best guide is simply to take advantage of every bit of natural wood contrast in the stock. The trick is to bring the contrast up as much as possible in a natural appearance. Excess stain will make the contrast appear artificial, or completely hide the contrast. Allow each coat of stain to dry, burnish it down lightly with steel wool and then rub hard with a cloth. Add stain coats slowly and you will have perfect control.

There was a time when you had to apply a separate coat of some ingredient to seal the wood, but the majority of modern stock-finish solutions will both seal and finish.

You have a wide variety of stock finishes to choose from, including the high gloss plastic finishes such as polyurethane and artificial lacquer, which are, without question, top notch and do an excellent job in protecting




*The stock with first coat of stain partially applied. Note contrast. After drying, the contrast will be lighter and more uniform, bringing out the best of the wood grain.*

the wood. I personally feel however, that they are out of place on a muzzleloader's stock. You can use a compound to dull the high gloss, but it cannot match a hand-rubbed oil finish.

Before applying any finish, look at a section of your stock with a magnifying glass. You will see that the wood has pores, just like the pores in your skin. These pores have to be filled, or the finish will have dimples like an orange. If the pores are filled, the wood surface will be smooth and so will the finish.

You have two choices. You can use a stock filler, or you can apply a series of coats of oil finish. If the latter, steel wool the finish back down to bare wood, leaving the finish in the wood pores. Either choice is acceptable.

Birchwood Casey, G-96 and Herters make excellent stock fillers that also contain a stock-sealing agent, which are applied with your fingertips. Smear it on the stock heavily in all directions, working it down into the wood pores. Allow it to dry, then, with an old bath towel, wipe cross grain – not with the grain. This leaves the filler in the pores, but cleans the wood surface back to bare wood. Rub the stock hard so that no filler remains on the wood surface. Most fillers use Fuller's earth as the ingredient to fill the pores. If this is left on the surface, the wood will not be smooth. Do not use steel wool to remove the excess filler, as it has a tendency to also remove some of the filler from the wood pores. You can now start to apply the oil finish.

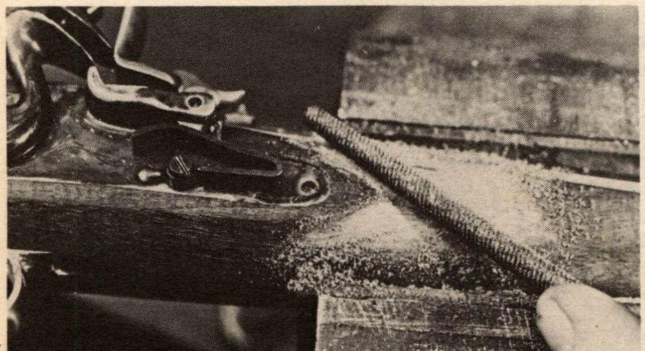
The second method, using oil finish to fill the pores, usually gives a clearer finish; however, it does require more time and elbow grease. It is not complicated, as all you do is apply a heavy, sloppy coat of finish and allow it to dry. You are simply filling the pores of the wood with dried stock finish.

Next you use four aught (0000) steel wool, in a large pad size, and rub the stock hard, parallel to the length of the stock and with the grain. This cuts and removes the sloppy coats of finish on the wood's surface, but leaves the finish in the wood's pores. Rub the stock with steel wool until you are back down to bare wood on the stock surface.

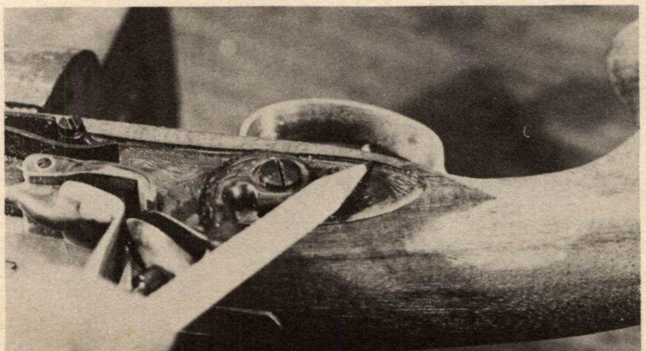
Use an old bath towel to clean away any trace of stock finish dust. You now are ready to start applying the final finish.

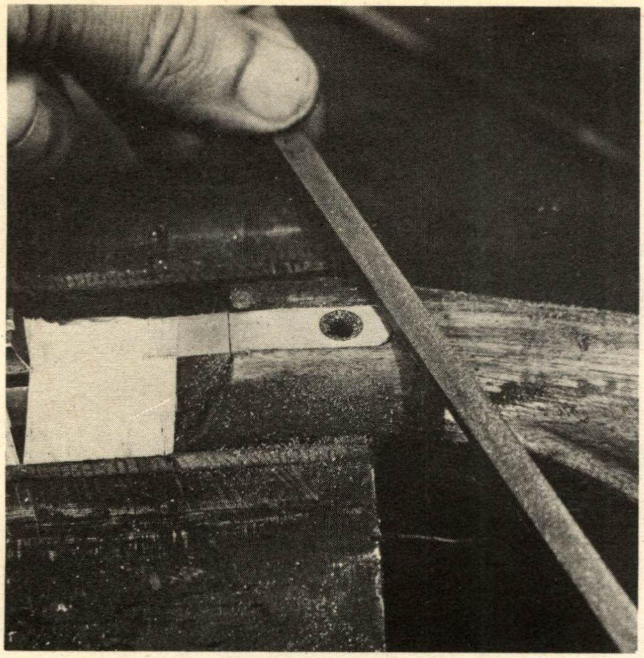
The choice of stock finish is a personal matter. With today's products, it is actually difficult to make a bad choice. Many kit manufacturers offer their own stock finish, and each one I have tried turned out fine. Birchwood Casey's Tru-Oil, G-96 Oil Finish, and Lin-speed are the three that I have most often used and, like everyone else, I have a tendency to stay with those with which I am more familiar.

*Hawes pistol, clamped in padded vise. The round file is used to cut and shape wood shield.*

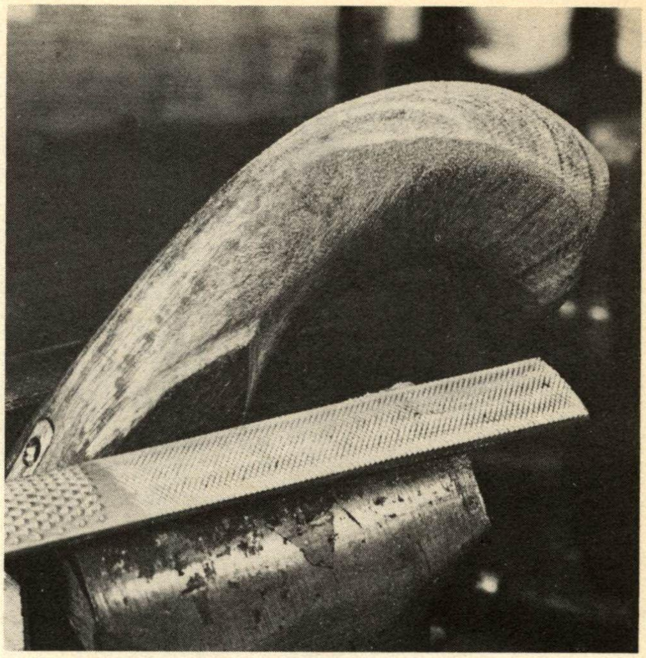


*A sharp lead pencil marks around lock plate before removing lock to prevent scratches.*





*Lock has been removed; filament tape used to hold and protect stock and barrel while in vise.*



*Stock is held in padded vise and four-in-hand rasp is used to shape and contour pistol grip.*

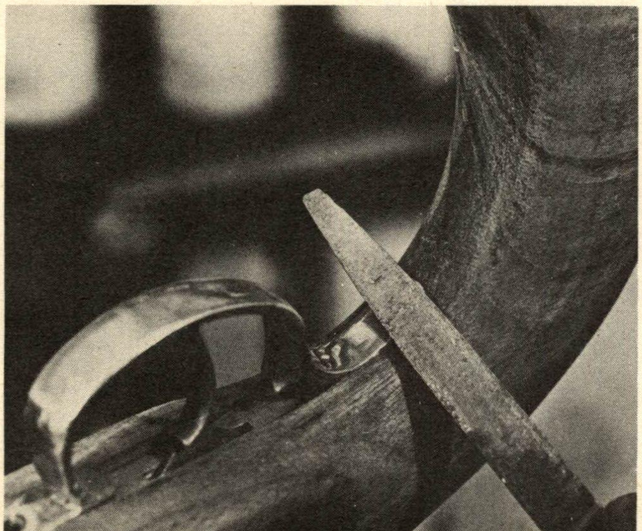
Of the three, I have used Tru-Oil the most and, consequently, choose it simply because I know exactly what it will and will not do under varying conditions. I personally think that a thorough knowledge of the product is more important than brand choice. Whatever brand you choose, read the instructions carefully and follow the manufacturer's recommendations.

Using Tru-Oil, after the wood pores are filled and all dust removed, dip a finger in the bottle and apply several drops on a small section of the stock. Using the palm of your hand, spread the drops over as wide an area as possible. Run your palm back and forth rapidly to press the finish down into the wood as you spread the coat. If correctly done, the palm of your hand will become warm from the friction.

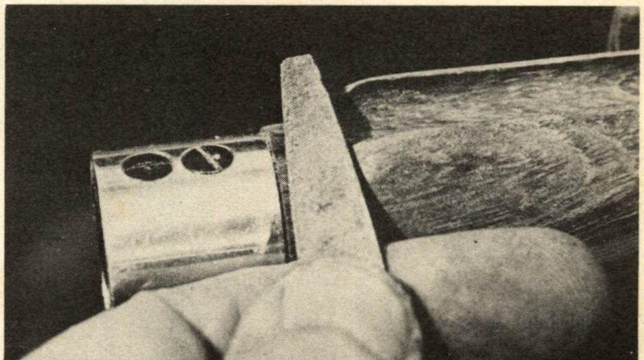
When the drops have been spread as much as possible, apply a few drops more to an adjoining area. Again, with the palm of your hand, spread the drops, being sure to blend the new area into the first area. Keep repeating this until the entire stock has received its first coat. The trick is to cover one area at a time, blending each new area into those already covered.

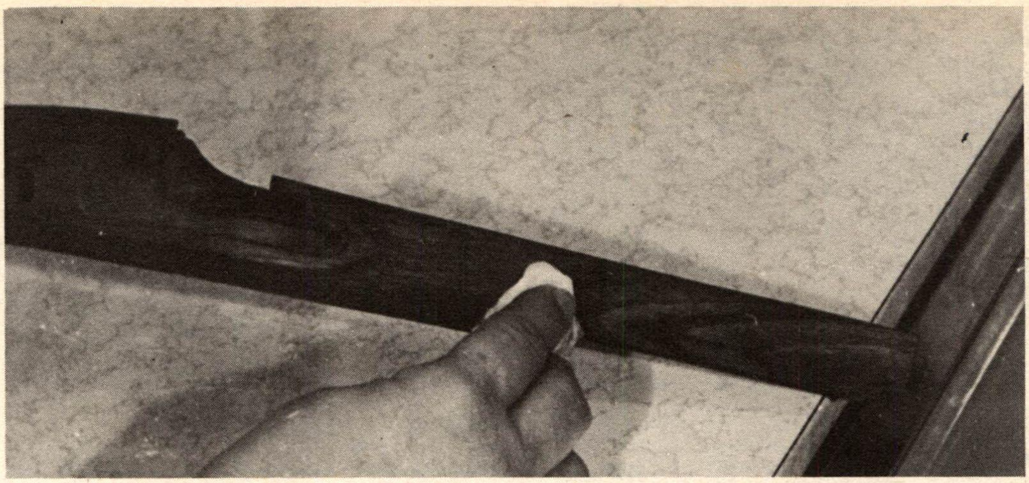
The coat of finish should be as thin as possible. Excess oil will give an uneven coat and usually results in runs, while a thin coat avoids runs and gives an even coating. Do not try to go back over an area already coated, as the finish has started to dry and you will only cause streaks in the finish.

The finish will be tacky to touch. Any dust will settle on the finish and become a part of the finish when it hardens. A wire hanger inserted in any hole through the stock can be used to suspend the stock while the finish dries. No part of



*Left: Brass trigger guard is not finished on outside surface and is filed and shaped to smooth finish, contoured to match wood. Below: Careful shaping of muzzle cap end.*





*All sanding complete, stock is moistened in preparation for whiskering.*

the finish should touch another item not even the suspending wire. Your clothes closet can be used as a dust free area if there is room.

A large, cardboard box can be made into a dust free area. Just cut a temporary door in the side, leaving one side to act as a hinge. Pieces of tape can be used to hold the door closed. A rod pushed through both sides of the box at the top will provide a support for the suspension wire.

Depending upon temperature and humidity, your first coat should be fully dry in two or three hours. The stock then is removed and a second coat of finish applied in the same manner as the first, and allowed to dry. Repeat the same procedure for a third coat.

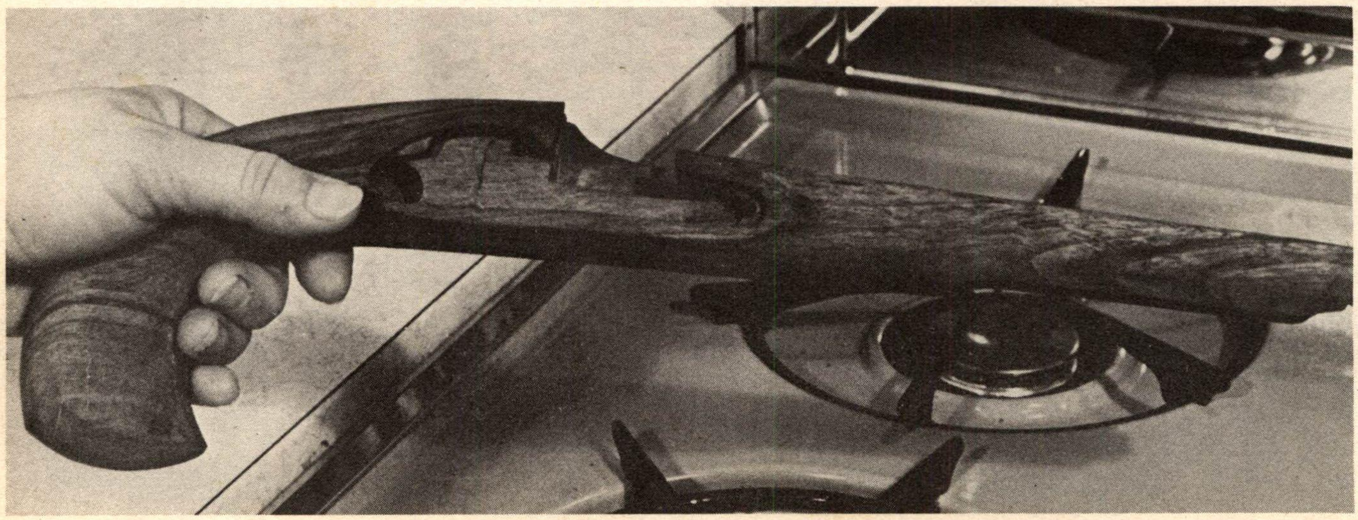
After the third coat of Tru-Oil, examine the wood surface closely. If there are deep dimples in the surface, the pores were not filled. The only solution is to apply a thick, sloppy coat, let it dry and steel wool the finish back to bare wood. If you have only a few shallow dimples in the surface, this step is not necessary. About three more thin coats will fill the shallow dimples.

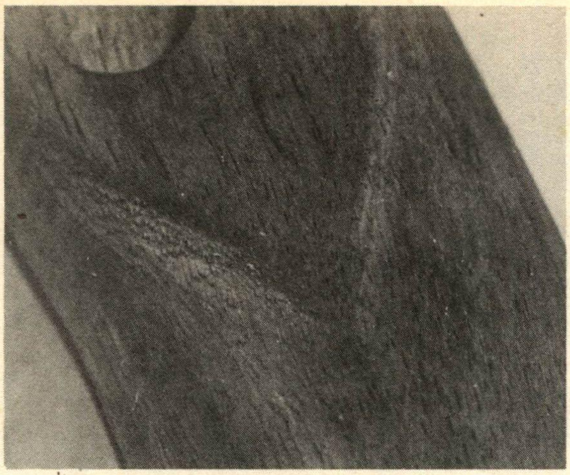
The number of coats of Tru-Oil is optional. Three is about minimum, and I usually apply about four or five thin coats to build up a good finish thickness. The finished appearance will be high gloss. You can leave it this way or turn the finish into a soft, velvet-like appearance. The latter choice closely resembles the old hand-rubbed oil finish on original muzzleloaders.

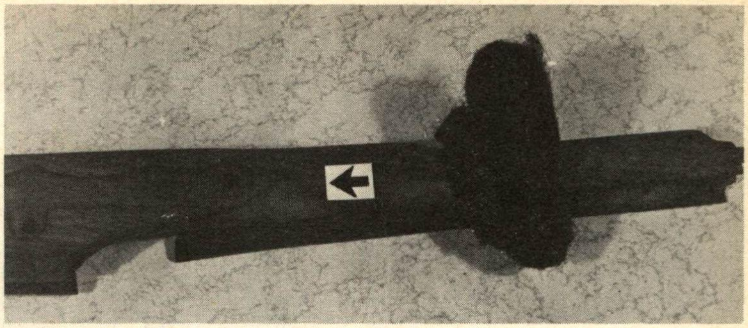
Birchwood Casey's Stock Sheen is easy to apply after the final Tru-Oil coat. It slightly dulls the glossy appearance and adds a luster to the finish. Just follow the simple instructions on the bottle. If you want a duller finish, try Du Pont Lacquer Finishing Compound, which is available in any auto paint store. It is white in color and is an ultra-fine abrasive compound. Its purpose is to smooth up a painted surface, so remember that it is removing finish! With a small amount on a piece of cloth, very lightly go over the stock surface with absolute minimum pressure. Now wipe the stock with a clean cloth. If necessary, repeat the procedure. If heavy pressure is used, you will cut right through the finish to the bare wood. When the results are satisfactory, apply a coat of Stock Sheen and the job is complete.

Tru-Oil is best applied with the palm of your hand. After

*The moistened stock is held about a foot above the kitchen stove burner to heat the stock. As moisture turns to steam, whiskers are raised on wood. Do not scorch stock.*







*Left: Close-up of the whiskered stock. Above: The raised whiskers are cut off with 0000 steel wool rubbed from the small end of stock toward the larger end of stock as indicated by arrow.*

application to the stock, your hand will be sticky. Use mineral spirits or kerosene to dilute the finish on your hand and then wash with soap and water.

After finishing the stock, some of the components may not go back into their inletted recess. This is due to the finish that has accumulated in the recess. Use a wood scraper, lightly, to remove the finish build-up and the part will go right back into its recess.

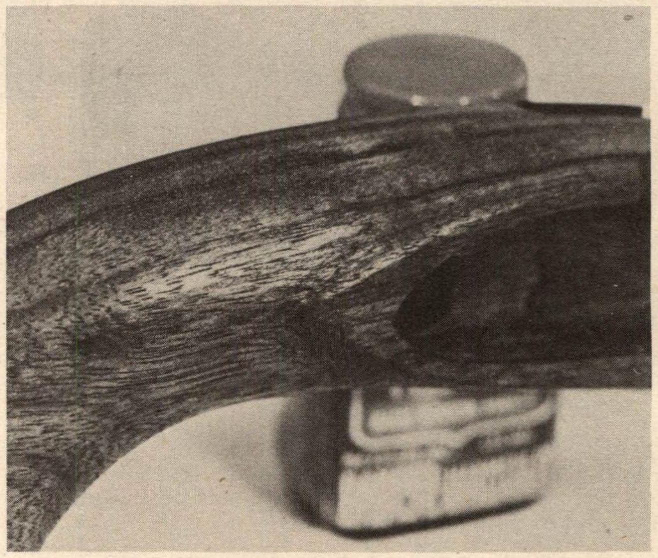
The various brands of stock finish will give slightly different results; however, they all should be applied in thin coats, and each coat allowed to thoroughly dry before applying the next. A poor finish is always due to improper stock preparation or a violation of the foregoing. If done correctly, the beginner's first stock-finishing job will be successful.

Many black powder shooters often ask how the original stocks were finished when modern finishing supplies were not available. Methods varied, of course, with individual gunsmiths – except for a few things, such as the use of stains derived from natural elements.

Rasps were available, and new and used metal files were utilized more than they are today. Wood planes also were used more, and it is interesting that the bodies of the planes were made from wood, the metal blade being held in place

*Birchwood Casey's Finishing Kit, instruction booklet and Hawes stock.*


*A set of five Brownells' water-base stains. They may be used individually or mixed. The colors are orange, yellow, red, brown and black.*



*The first sloppy coat dried, steel-wooled back to bare wood. Some pores are not completely filled.*

by a simple wood wedge for blade depth control. Unlike the common wood plane of today with its flat bottom and square blade, homemade planes were curved inward with the blade ground to match the curve. This allowed wood removal, such as around the forend, to be very rapid, as the concave bottom surface rounded the forend as it cut. The draw knife and spoke shave also were used more to shape the stock.

The main tool used for final shaping was a metal scraper, usually nothing more complicated than a good knife. In the hands of a craftsman, a common pocketknife can rapidly and smoothly complete the final shaping. Pumice stone, rottenstone and whiting (coarsest to finest in this order) are fine abrasives. A damp piece of thick cloth, backed with a wood block, was dipped into the abrasive compound and then rubbed back and forth on the wood. The results were similar to sandpaper, but more care was required. This was the way I was first taught to finish a stock. The old ways die hard, and I honestly cannot remember when I first used sandpaper and abandoned the old method.

A common method of final finishing is called boning the stock. It is not difficult and makes an unusual finish. A little boiled linseed oil – raw linseed oil is a poor choice – is first rubbed into the stock by hand. Boiled linseed oil is available at most paint stores and produces superior results. Incidentally, the linseed oil is not actually boiled; it is cleaned with acids to remove impurities.

When about two coats are rubbed into the wood, select a piece of bone; a leg bone or any bone about a half inch thick and dried smooth is ideal. All you do is rub the stock hard, lengthwise back and forth, with the bone. The more you use the bone, the smoother it becomes. The pressure closes the wood pores by compressing the wood surface. Occasionally add a drop or two of linseed oil and the wood will soon become hard and slick with a nice soft sheen.

If you never use this method on a stock, try it on a ramrod. A boned hickory ramrod will be firm and slick and last much longer. While on the subject of ramrods, whoever started the wild story of soaking a string in gas or oil,


*Application of the sloppy coat of Tru-oil to fill the pores of the wood.*


*With the second filling coat now complete, the stock is ready for the final thin coats.*

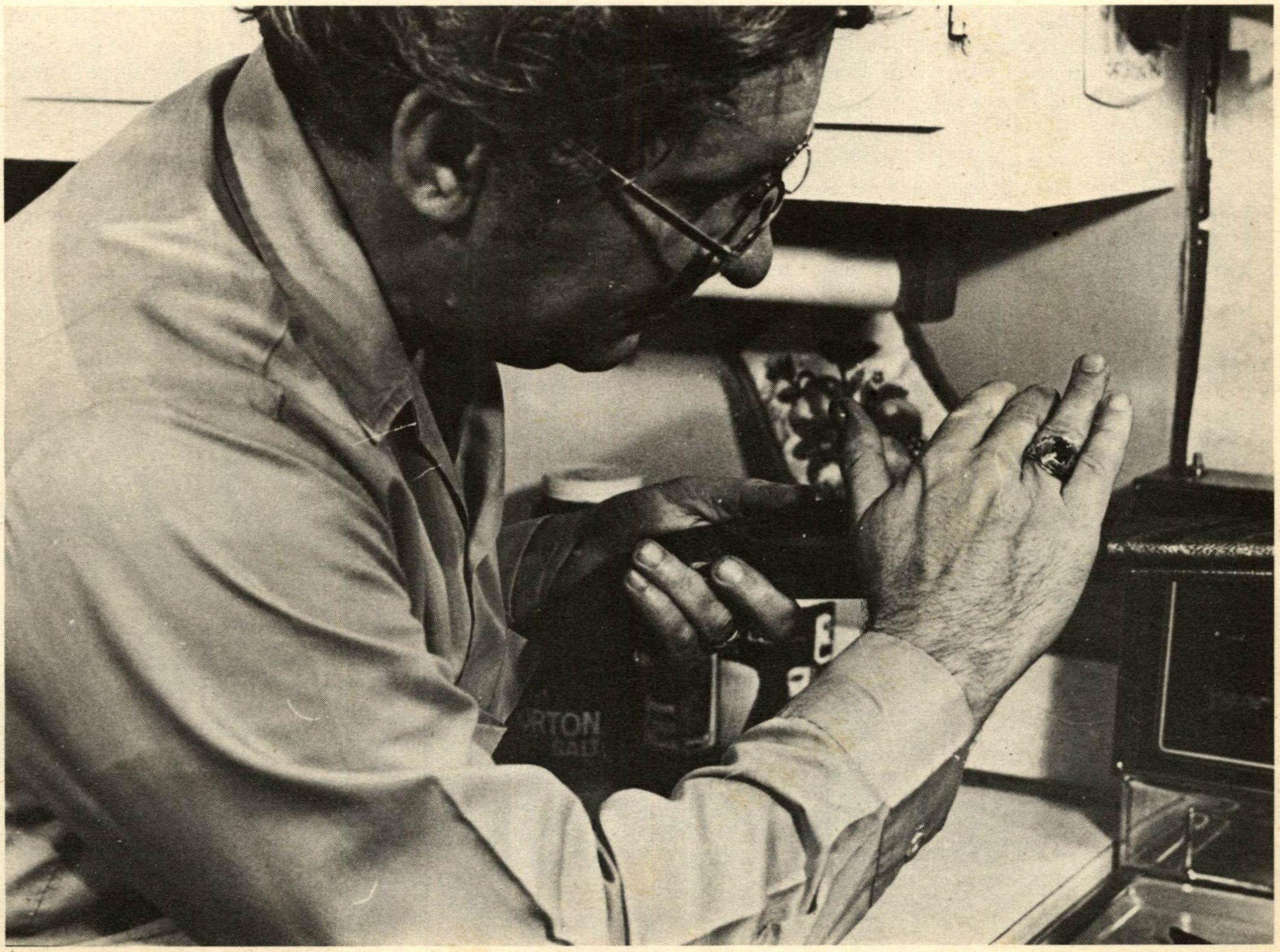
*Ralph Walker applying the final thin finishing coats with the palm of his hand, making long strokes of blending just a few drops of the oil.*

wrapping it around a ramrod and then setting the string on fire to obtain a spiral effect was short in the brain department. The string will just burn in two and fall off the ramrod.

You can soak a piece of string in a dark stain, wrap it in a spiral around the ramrod and the stain will transfer to the wood. Most of the old gunsmiths just pressed the ramrod against a thin section of red hot metal, twirling the ramrod and pressing it down its length to lightly scorch the wood. The ramrod was then smoothed and boned. With a little practice on scrap wood dowels, you can just use a propane torch, set on low flame, and pass the ramrod across the flame as you twirl the ramrod to get a dark, spiral effect. Bone or burnish with steel wool until the ramrod surface is smooth and slick.

There are two good books on the subject of wood that you will find interesting and useful. *Know Your Woods*, by Albert Constantine, 2050 Eastchester Road, Bronx, New York, deals with the identification, properties and uses of wood. *Gunstock Finishing and Care,* by Donald Newell, is available from Brownells Incorporated, Montezuma, Iowa, and is gunsmith-oriented with a wealth of practical information.

The shaping, preparation and finishing of the wood in a black powder reproduction-replica kit can bring a lot of pleasure, as it allows you to bring out the best in the wood of even the simplest kit. It is also an excellent school of practical experience.



CHAPTER 10

# METAL PREPARATION AND FINISHING

## The Basics Of Metal Preparation, Browning, Bluing And Other Finishes

IN ALL THE instruction booklets packed with black powder reproduction-replica kits, and all the articles that have been written about them, the subject receiving the least amount of explanation is metal preparation and finishing.

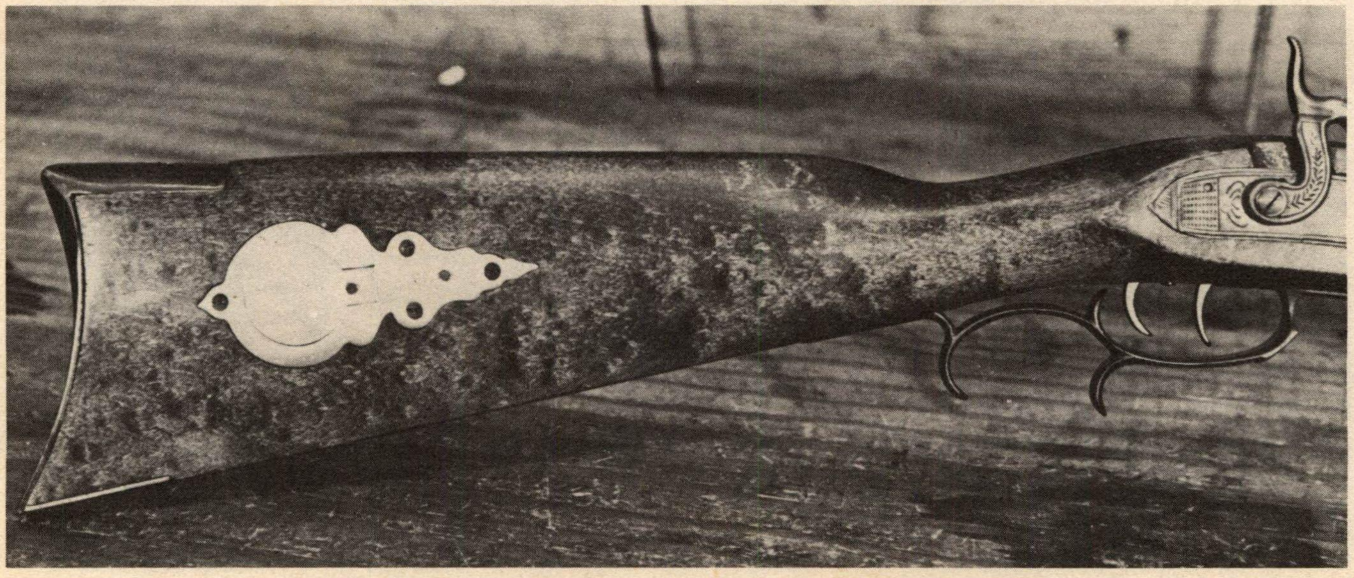
If anything, the majority treats the subject as though it was as simple as pouring syrup over your breakfast pancakes! If this was true, why then do full-time professional gunsmiths charge so much for a good bluing or browning job?

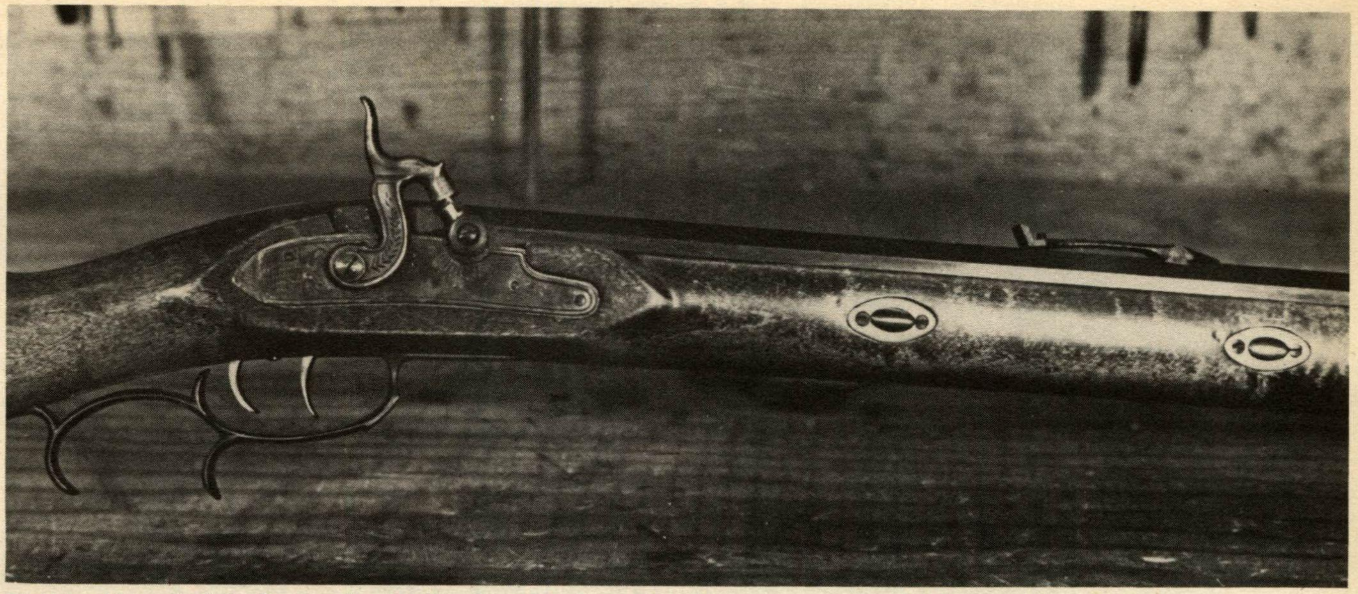
Three key items are involved. Knowledge is the first. There are no deep, dark secret formulas involved, for the ingredients are well known. Second is correct procedure and, again, this also is well known. Time is the third and, to a full-time professional carftsman of any trade, time translates into dollars. The hobbyist does not have this problem, for his source of income does not depend on gunsmithing. However, the time element does not change nor does correct procedure or the required knowledge.

Black powder guns almost invariably have brass, German silver and other metals that are not normally found on most modern guns, so we will leave them last on the list. Steel and iron are common to both, so let's cover them first, as much of the preparation procedures for steel and iron also apply to the other metals.

There is no such thing as steel ore or pure natural steel. There is iron ore and almost pure natural iron. If you add other various metals to iron, you have an alloy, and steel is simply an iron alloy. The other added elements forming the alloy gives steel certain desirable properties, such as

*Rear section of the finished CVA mountain rifle features a German silver patch box with blued screws, a blued butt plate and trigger guard. The staining methods mentioned in previous chapter bring out wood figure.*





*The blued barrel of the Connecticut Valley Arms black powder rifle contrasts with the German silver furniture.*

strength, elasticity, machinability, etc. However, remember that iron forms the base of the steel alloy.

Ferric is iron at its highest metallurgical value. Add oxygen and we get a binary compound, ferric-oxide. Sounds really fancy and technical doesn't it? The common name is plain, old, red rust! Browning is nothing more complicated than controlled, red rusting; but note the word controlled.

Anything that rusts steel and iron can be used to give the brown color, but if not controlled it goes its own route and you end up with just a rusty gun. The basis of a good browning job is that you control the amount of rust, halt its progress, allow it to rust again and then halt its progress again. This is repeated over and over in layers until you have an even distribution of the color, the amount of color desired, and the color where you want it to be.

Around 1820, gunsmiths discovered, through trial and error, that they could obtain a black color on a metal surface by using various chemical solutions. This is commonly called bluing in the firearms' industry, although the British term all metal-finishing variations browning. Actually, both are technically incorrect. In the metal-finishing industry it is known as black ferric-oxide, or just black oxide. So, in reality, bluing is nothing more than controlled black rusting.

This was the era of home brew-bluing formulas, with almost every gunsmith and manufacturer having his own closely guarded secret solution. Some worked, producing excellent results, while others would not darken a nail! The formulas that were published or manufactured and sold had the same hit-or-miss problem.

Two major problems existed. Commercial chemicals varied greatly in purity and strength. One batch would turn out fine, while the next gave only partial results. The other problem was in the composition of the steel alloy. A bluing solution would work perfectly until the next batch of steel was purchased, and then the finish went crazy with some parts dark and others untouched.

The bluing solutions of today are consistent in purity and strength. In addition, the formula is specifically designed to work on a wide range of steel alloys.

You learn from experience, especially the ones that are costly mistakes. Iv'e tried about every home brew bluing and browning formula published. Some give excellent results, while others are a complete flop. If you want to try your luck, I highly recommend the best book on the subject, *Firearms Bluing and Browning* by R.H. Angier, which is available from Brownell's Incorporated.

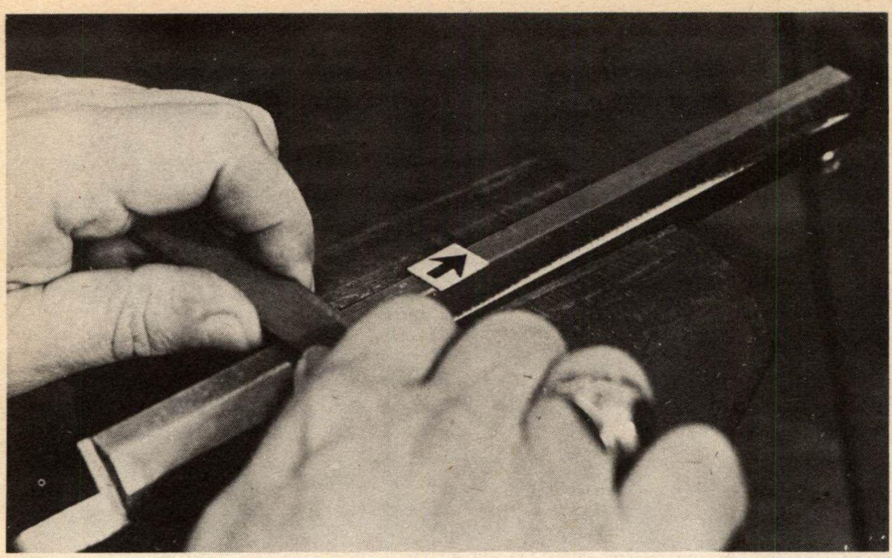
Personally, I recommend that you stick to the use of commercial solutions. There is no shortage to choose from, and the end results will be more consistent than most home brew concoctions. Each has its own slightly varying characteristics and, like stock finishes, it is primarily a matter of personal choice.

Regardless of the solution you choose to use, fully sixty percent of the quality of the metal finish will depend on correct metal preparation. Another twenty percent will depend on correct application of the chosen solution, with only the last twenty percent dependent upon the solution formula.

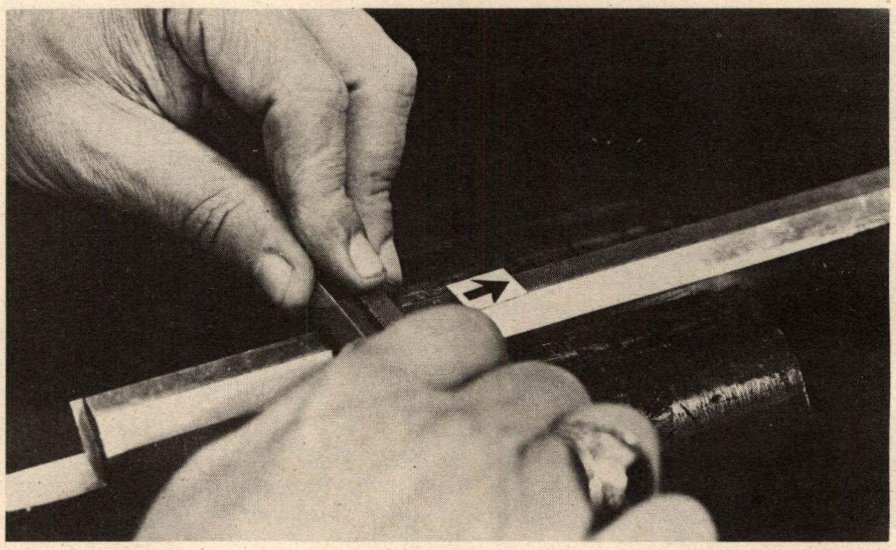
Most beginners, having visited a professional gunsmith shop, have the mistaken idea that power buffers and polishing wheels are an absolute necessity to metal preparation.

Actually, some of the most expensive, modern guns money can buy are never power polished. Every piece of metal surface is one-hundred percent hand polished. Even if you have the finest power-polishing equipment available and ten years of polishing experience, you face a major problem with black powder firearms; most have octagonal barrels, eight flat surfaces with each surface joining the next at an edge.

Even with the power wheels properly charged with compound and in perfect vibration-free rotation, it is extremely difficult to polish one of these flats the full length of a barrel. The slightest mistake, even in your grip on the barrel, and zip; the polishing wheel changes contact



*In draw filing the Hawes Kentucky pistol barrel, it actually is push filing. (Note arrow.) Thumbs, fingers are close together on single-cut parallel file, which is held at 90-degree angle across barrel. File is lifted clear of metal at each stroke.*



*In polishing with aluminum oxide cloth around the file, the same hand position is used, except that ends of cloth are held with tips of fingers to protect metal from file.*

with the flat surface and rounds off one of the edges. Power polishing is fast, but a mistake is equally fast.

Hand polishing is a different ball game. It is naturally slower, but you have absolute control at all times. All the equipment required are files and aluminum oxide cloth in grits 120, 220 and 320. The best way to purchase aluminum oxide cloth is in rolls, 1½ inches wide.

The barrel is the major component that has to be polished. If you remove individual parts, such as sights, ribs, tenons and other items down to the basic barrel, the polishing job will be much easier. There is no need to remove the barrel plug. If the plug and tang are one unit, treat it as part of the barrel in your polishing.

Closely examine each of the octagonal barrel flats for any scratches, dents or burrs. At the same time note how much the barrel is already polished or finished. If the barrel has scratches, dents, burrs or heavy machining marks, then it will require draw filing. If, on the other hand, the metal is relatively smooth, draw filing may not be necessary. There is a standard rule in polishing to start with the finest grit possible. It just does not make sense to start draw filing or using a coarse grit that will dull the existing grade of polish. You may later find that you have to go back to a coarser grit, but nothing is lost in making a try with a finer grit.

If draw filing is necessary, the best files are six-inch single-cut parallels in medium and fine cut. I have found these two files to be fully adequate and give the greatest amount of control. Push filing would be a more correct term, as the file is always pushed away from you, making a full barrel-length stroke, then lifted and returned for the next stroke. The file is never pulled back toward you, as the file teeth will not cut and you will only clog the file with steel shavings and scratch the barrel's surface. A file-cleaning card should always be handy to clean the file teeth of imbedded metal slivers and shavings. An old filing trick is to rub common chalk across the file. It fills the spaces between the file teeth, helps prevent metal from imbedding and does not interfere with the file's cutting ability.

The file should be held at an exact ninety-degree angle to the barrel's length. Hold your hands, one on each side of the barrel, as close together as possible yet still allowing the barrel to pass between your hands. The thumb of each hand should be on the rear edge of the file. Pressure is exerted

with the thumbs, not the hands, to push the file forward. Just the weight of your hands will provide sufficient downward pressure. If excess pressure is exerted downward you actually bend the file and form an arc. You want the file to lay as flat as possible.

There is a natural tendency to remove more metal at the beginning of the push stroke than at the finish of the stroke. To compensate, file from breech to muzzle for a while and then switch and file from muzzle toward the breech. These strokes are removing metal in shavings, and few people realize how much metal is being removed!

Make from six to twelve strokes on one flat. Stop, unlock the vise, rotate the barrel to the next flat, clockwise or counterclockwise. Lock the vise with the barrel in as near the horizontal level as possible. Now make the same number of strokes with the file. Unlock the barrel, rotate in the chosen direction to the next flat, lock the vise and repeat the same number of strokes. Repeat this procedure until you have made a full revolution of the barrel. This is the best method of assuring that the same amount of metal is removed from each flat.

If you started with a medium-cut file, examine the surface to see if additional filing will be necessary with the fine-cut file. If so, make exactly half the number of strokes on each flat.

The purpose of draw filing is not to see how much metal you can remove, and it is not to polish the barrel. The purpose is to level the flats and remove any deep scratches, dents and burrs. The least amount of metal removed, the better.

Now switch to an aluminum-oxide cloth. If draw filing was necessary, this should be 120 grit. If it was not necessary to draw file, try the finer 220 grit first, remembering that you always can go back to the coarser 120 grit if the 220 does not get the job done. With some kits the barrel is very close to final finish quality, and you can begin with the even finer 320 grit cloth.

Tear a four-inch section from the roll of the chosen grit. Lay the file on the back of the aluminum-oxide cloth and roll the edge of the cloth over the front edge of the file. The aluminum-oxide cloth with the file backing is held on the barrel flat, exactly in the same position as if you were draw filing. By rolling the edge of the cloth over the file's edge, you prevent the file from making contact with the barrel and scratching it. Make the same strokes as in draw filing. If the cloth is wide enough to lap over both edges of the file, you can make both a push and a pull stroke. Each stroke will make the surface of the barrel flat smoother.

Repeat the same procedure of turning the barrel to the next flat as in draw filing. As the strip of aluminum-oxide cloth becomes worn, replace it, as often as is necessary. Use the same chosen grit until the barrel has made a full rotation. Now switch to the next finer grit and repeat the procedure.

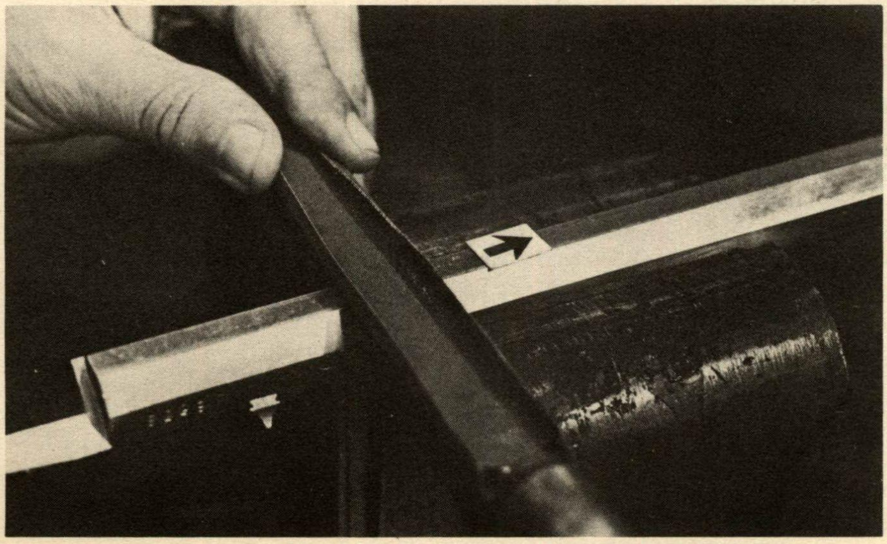
The final 320 grit cloth should leave the barrel with a nice, soft, velvet-like sheen. In all of your polishing or filing, do not make a stroke across the barrel! All strokes must be parallel to the length of the barrel.

With the exception of a few exhibition guns, the majority of original guns had a soft, velvet-sheen polish. A high-gloss polish can be obtained by using finer grit aluminum-oxide cloth, however, the higher the gloss the more easily even the faintest scratch on the metal surface can be seen.

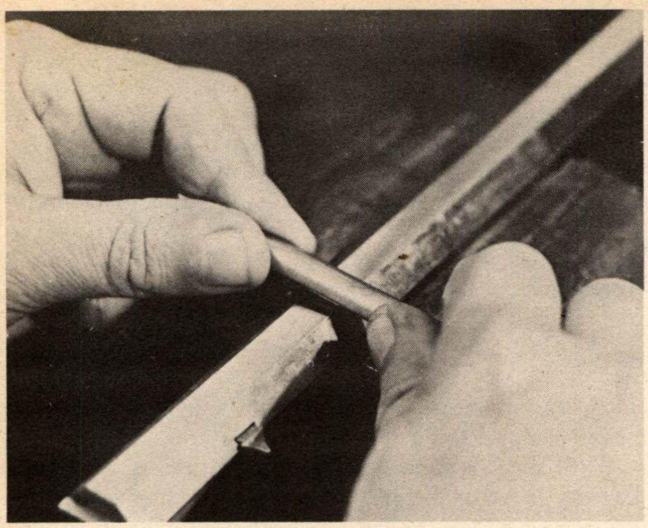
If you want a slightly higher gloss but with the same soft, velvet appearance, try using a burnishing tool. The process is very similar to boning a stock. The burnishing tool is pushed back and forth the length of the barrel with slightly heavy pressure. The barrel surface must be free of all aluminum-oxide dust, as only a small particle will scratch the surface. A burnishing tool has many uses, is inexpensive, and well worth trying. I would suggest that your first efforts be on the bottom of the barrel near the breech end. You then can decide if you want to burnish the entire barrel, and the section burnished will be hidden from view if you decide to stop.

The other parts, such as the sights, should be gone over with needle files first to remove burrs and imperfections. You can polish by hand with the aluminum-oxide cloth, using odd-shaped pieces of wood for backing. Follow the same progression of coarsest to finest grit.

A Dremel Moto-Tool equipped with a polishing point will bring hard-to-reach areas to a nice polish rapidly. If desired, you can use the felt-polishing bobs charged with polishing compound on large areas. Brownells 400-grit Polish-O-Ray compound is inexpensive and the best compound to charge



*Author has removed one hand from the aluminum oxide cloth to illustrate method by which it is wrapped on file.*



*Burnishing tool is used for final polish as outlined in text. Hand position is similar to draw filing, but hard, downward pressure is used in both-way stroking.*

the bobs. Turn the Moto-Tool on low speed and press the bob against the compound. You can see it change the bob easily. Allow the bob to rotate to dry the compound. About 2000 rpms is the right speed.

With all of the steel and iron parts polished, we are ready to start the very important cleaning operation. How thoroughly you do this job will play a very important role in the metal finish. It is the one phase of bluing or browning that is most overlooked, and the direct cause of the majority of failures.

Regardless of whatever we blue or brown, remember that we are control-rusting the metal. Any oil or foreign substance on the metal acts as a shield and prevents the chemicals from coming in contact with the metal surface; hence, the chemical cannot rust the metal under the shield. To give an example, if you have polished a barrel and begin to blue it in a commercial hot salts tank after placing your finger on the barrel, the finished barrel will have a perfect fingerprint mark where you touched the metal. Commercial hot-bluing salts are much more concentrated than the solutions used on kits, yet even they cannot overcome the contaminated area!

Do not use any form of oil on the polished metal. It has to be removed in the cleaning phase and just makes the job harder. It is always best to be ready to blue or brown when the metal is finished in the polishing step.

There are numerous commercial cleaners and degreasing solutions on the market. Many come with the new muzzleloading metal and wood-finishing kits. In use, the solutions are applied to the metal with a cotton swab and then the metal is wiped thoroughly with a clean cloth. You can add to the efficiency by making up several extra cotton swabs and discarding them as you go along. You discard the oil and other contaminations the swab has absorbed. Also do the same with the wiping cloth. Use several, discarding them as you progress in cleaning.

To avoid adding to the contamination, use wire hangers to hold the gun. If you must touch the barrel and parts, buy a couple of pair of cheap white cotton gloves. There is no such thing as getting the metal too clean!

An old trick to get all the oil off the surface is with the use of lime. It was a standard procedure used by old gunsmiths. You simply add water to the lime until you have a paste, which is then smeared thoroughly over the entire metal surface. The lime-coated metal is then hung to dry, the lime absorbing the oil in the metal as it dries. When dry, use steel wool or a clean towel to brush away the dried lime. Finish by running water over the metal to wash away any remaining lime.

If you wish, you can use this old procedure first, then follow up with use of modern metal cleaner and degreaser. There is a very simple test to make to see if the metal is clean. Place a little water on the metal. If it runs off easily, the metal is not clean. If it tends to puddle and resists running off, the metal is clean.

The best metal-cleaning process is with the metal suspended in a heated container. Use commercial cleaning solutions or some of your wife's dish detergent. Heat the solution until it simmers; just below the boiling point. Leave the metal in the cleaner for about five minutes, then remove and flush thoroughly with clean, running water. Any container can be used, such as an old pan for handguns. Most feed stores have inexpensive chicken-feeding metal troughs that will serve the purpose for rifle barrels.

Do not forget to clean the bore of all traces of grease. Hot, soapy water and a ramrod are the best methods of cleaning black powder out of the bore in normal gun use. The patch around the ramrod acts as the plunger while the breech is submerged in the hot water. Just do the same thing to clean the bore of oil before bluing or browning. Add one extra step by repeating the operation using hot, clear water to remove soap or detergent residue.

Touch-up Blue is useless when it comes to bluing a complete gun. As the name clearly states, its purpose is to touch up small areas, such as a screw or small scratch on the metal surface. Most are simply copper sulfate and hypo. The copper sulfate puts a thin layer on the metal and the hypo blackens the copper. You can even smell the copper. Some use a more complicated and better formula, but this does not change its purpose.

The old browning method generally contained some form of saline solution, a mixture of salt and water. One of the favorite methods of the old gunsmiths was to cut strips of salt pork and tie it to the barrels. The next day it was removed, the rust carded off and the salt pork tied back into position. After several days of building up a coat of red oxide, the barrel was thoroughly washed to stop the process and then several coats of oil were rubbed into the metal.

Older bluing solutions followed the same basic procedure. The metal was coated with the bluing solution and allowed to work for a day. When removed, it left a reddish tinge of oxide, but when this was rubbed off, the metal underneath had a thin bluish-black coat. The solution was again applied and the process repeated until deep, blue-black color resulted. The surface then was thoroughly washed and several coats of oil rubbed into the metal.

These methods are called slow-rust browning and slow-rust bluing. The amount of time and number of coats of solution depend on the composition of the steel plus the temperature and humidity. At best count a week was required, and even a month was not uncommon. While the finished product was very durable and had a tinge or shade

hard to duplicate by any other method, it was time-consuming and correctly named.

If we remember that steel and iron absorb oxygen to form ferric-oxide, then, obviously, if the rate of absorbtion can be increased, the time required to build up a coat will be decreased. If you heat one end of a cleaned piece of steel or iron, the next day you will discover that the heated end will have a rust coat two or three times thicker and greater than the end that was not heated. As another example, a welder's cutting torch first melts steel or iron, then a strong jet of pure oxygen is directed into the molten metal. It is the ultra-rapid oxidation of the metal that makes an oxy-acetylene cutting torch work.

So, if you increase the temperature of metal it absorbs oxygen faster and forms the ferric-oxide coat faster. However, if heated too much the metal can lose or change hardness. Too much oxygen introduced artificially results in loss of control.

The slow-rust process can be accelerated in the time factor very easily. As humidity is moist air, and water is two parts hydrogen and one part oxygen ($H^2O$), then placing the steel or iron part in an area that contains heat and high humidity will result in a more rapid formation of ferric-oxide on the metal surface.

The ideal controlled area is a steam cabinet, such as used by many early manufacturers and some gunsmiths. A simpler version consists of a metal tank of clean water heated to a slow boiling point. The metal part, immersed in the water, naturally increases to the temperature of the water – around 212 degrees Fahrenheit. The bluing or browning solution is suspended in the tank in a separate container, open at the top but with the top above the water level, and it, too, is raised to the same temperature.

The gun part is removed from the water and a cotton swab dipped into the hot bluing or browning solution. The gun part is then coated in a painting motion with the saturated cotton swab. The temperature of the barrel dries the solution immediately as it is coated. When it stops instantly drying the solution, the barrel is too cold and the swabbing of the solution on the barrel is stopped.

The oxide coat forms very quickly and the barrel must be carded or rubbed with four aught steel wool to remove the rust scale; although the surface will begin to take on the desired color. After the scale has been removed, the gun part goes back into the boiling water to raise its temperature again so that another coat of solution can be applied in the same manner as the first coating. This is repeated over and over, the color of the metal darkening with each application.

When the desired color is obtained, the part is again immersed in the hot water. This time oil is continually swabbed on the heated metal until the barrel becomes cold and holds a heavy oil coat. The last water immersion washes away any lingering solution and the oil finishes the job of halting the oxidation.

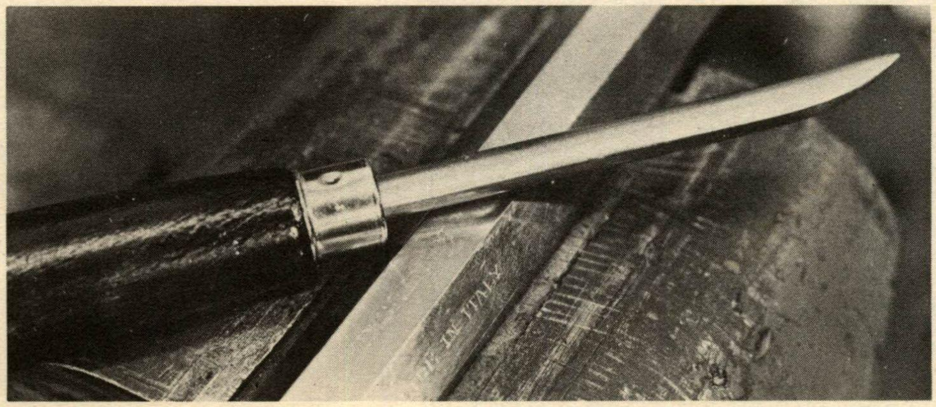
This was the standard process in bluing until manufacturers and gunsmiths adopted the current hot salts solution, although the process is still used in many gun shops, especially on double-barrel shotguns and when restoring antiques. Gun shops specializing in browning use the same procedure, only fewer coats of solution are required.

Individual solutions may vary the process slightly. Use of Herters' Belgian Blue follows this process very closely. Brownell's Dicropan IM calls for the same basic procedure with a slight variation. Both companies provide a set of full instructions, both are bluing solutions, not browning.

With the growth of the reproduction-replica kit industry, several manufacturers have come out with both bluing and browning kits for the hobbyist. Each of those that I have tried gave excellent results. I would caution the beginner to thoroughly read the manufacturer's instruction. As a further note of caution, use only the kits or solutions that specifically state they are designed to blue or brown an entire gun, and avoid solutions that fall in the touch-up category.

The solutions contained in such kits vary in composition, so I cannot make a blanket recommendation that the solution be heated before application. I do know that heating the metal part will accelerate the process and give a deeper, more even, and more durable finish. Immersing gun parts in boiling water is the best method of raising the metal temperature evenly and, at the same time, the temperature for each coat of the solution. Thick parts hold heat longer than thin parts, so always start at the thinnest section to take advantage of the heat before it decreases.

A tank of boiling water is not always available or practical for the hobbyist. About the next best way to raise the temperature is to use a propane torch. Even if available, an oxy-acetylene torch should not be used, as the acetylene is not always completely consumed in the flame and will contaminate metal surfaces. Natural gas and butane are in about the same category. You can easily see this on pots



*Brownell's burnish tool is a curved tip style. Note that the metal now has a bright sheen, ready to be blued, browned. When this has been achieved, no more polishing is needed.*

and pans that are used on a stove burning these two fuels. Propane, used in hand-held torches, burns almost perfectly clean.

The small can and wood jig that holds the propane torch upright and steady on your bench is ideal for this operation as it leaves both hands free. In some instances you will have to support a long part, such as a rifle barrel, and move the torch up and down its length. A steel rod, slightly smaller than the bore, can be clamped in the bench vise with a foot or more extended at a slight upward angle. The barrel can be rotated and heated with this setup. Small parts can be held on a wire. In all cases, avoid contact of your fingers with the clean metal.

Try to heat the entire surface up to the same temperature level. If the solution sizzles and dries quickly, you have the correct temperature. You will get a more even color if all of the metal is at the same temperature. If you cannot get the metal hot enough to sizzle and dry the solution, you are better off settling for a lower but even temperature.

Work with one part or component at a time. Give it a good, even coat of solution with a cotton swab. Next, hang it up and allow from one to two hours for the average chemical to work; the time will vary with the solution. Give the next piece or component the same heat-and-coat procedure. Discard cotton swabs when they become dark and discolored. Put a coat on every part and component.

Next, and without allowing your bare fingers to touch the metal, use a pad of four aught (0000) steel wool to card off the rust scale. Rub lightly and briskly. Depending on the metal's composition and the selected solution, you will have some shade of brown with a browning solution and a light blue-black with a bluing solution. If the coat is not even, don't worry, as additional coats will blend the coloring more evenly. Try to avoid runs when applying the solution. Use a steady painting stroke, blending each stroke with the area previously colored.

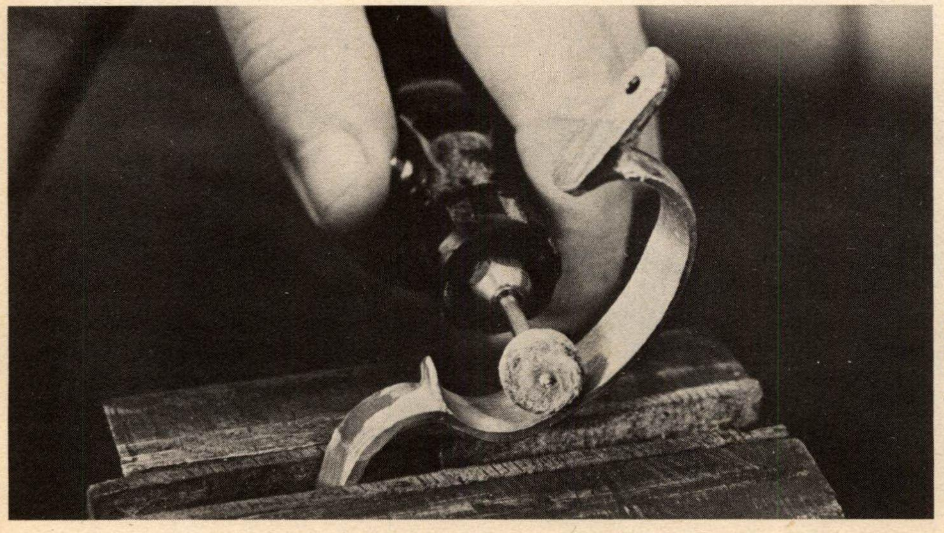
Now we repeat the entire process. Heat, apply solution, and allow the chemical to work. Then the steel wool rubdown is made. The steel wool removes loose scale and also burnishes the surface of the metal. Don't think that your light, brisk strokes are removing color. Any that is removed would not remain as a permanent bond anyway.

The number of coats required depends on the solution, metal composition, and metal temperature. Most hobbyists stop too soon. If I had to set a minimum for the number of coats, four would be about average. The best answer is as many as required to obtain the color shade desired. If anything, apply an excess coat or two. When you are satisfied, heat the metal until it is good and warm, then rub in several coats of good, heavy gun oil. Note that I said rub, for the metal will soak up oil for about two days.

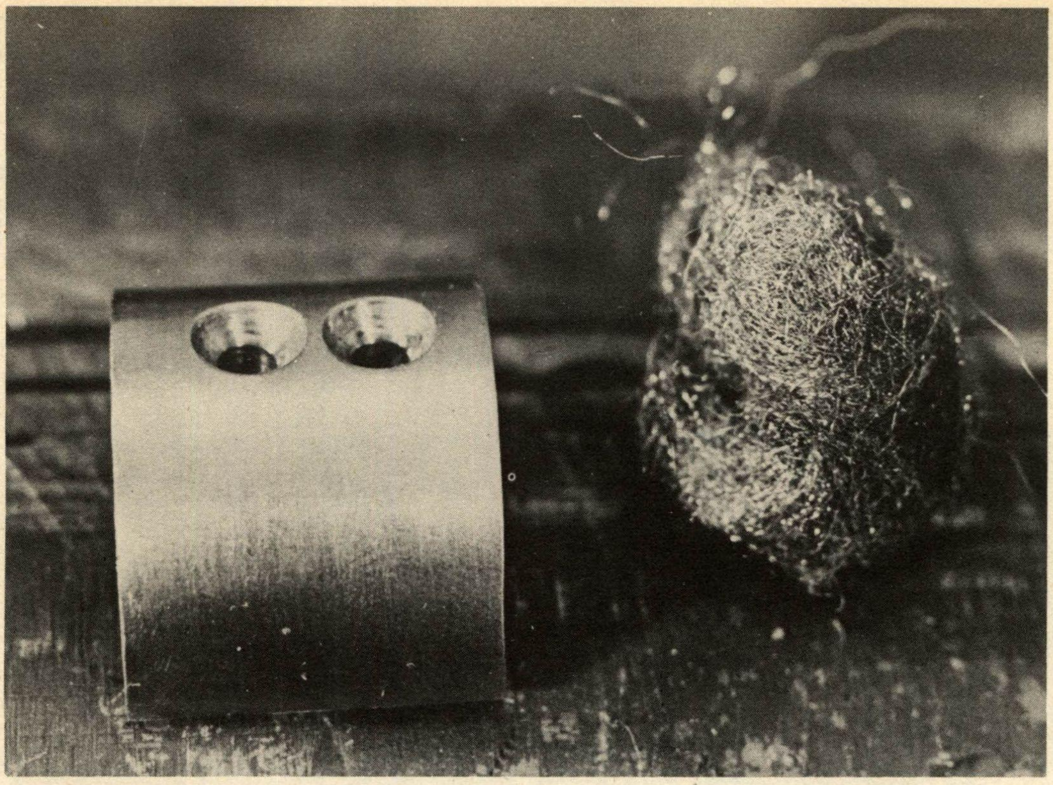
Occasionally, you will have a gun that just will not take a blue or brown finish without splotches in the color. The best solution is to have your druggist make up a gallon of ten percent nitric acid solution. At ten percent it is not a real danger, but should be treated with respect. If some gets on your hand it may sting slightly. Eyes should always be protected. Purchase a long, plastic, flower-planter tank to hold the acid. In about five minutes all of the old bluing and browning finish will be stripped off the metal. Now wash the metal with clean, flowing water. When finished, start your bluing or browning procedure over again. Ninety percent of the time this solves the problem, and you will obtain an even, nice finish.

This is the basic method of removing old blue and red rust in a commercial bluing operation. It is usually called the stripper tank. The same procedure is used in nickle plating, only muratic acid is used. In plating it is known as the pickling tank. Nitric acid is more commonly used, but muratic acid is the best choice as it is more versatile. A ten percent solution very lightly etches the surface and the bluing or browning will work better. It also is an excellent final cleaner, as the acid quickly removes all grease and oil. Fifteen percent is about maximum, as a higher percentage will start to eat rapidly away at the metal and the time factor becomes critical. This etching step is generally not necessary, but when bluing or browning will not take on the metal, it gets the job done. Common baking soda will neutralize either nitric or muratic acid and should be kept on hand as a safety precaution.

With bluing you will have an occasional screw head or a pin that needs to be blued, but you do not want to go to all the trouble of a regular blue job. Touch-up blue can be used if desired. A simpler method is to just use your torch to heat the head slowly. A straw-brown color will appear first, then a light blue and finally a dark blue. The moment the dark blue is reached, quench the screw head in oil. The



*A Dremel Moto-Tool with a felt bob charged with No. 400 compound is used to polish brass trigger guard of Hawes Kentucky pistol.*



*Steel wool has been used on the nose cap of the Kentucky pistol, a process which removes scratches, leaves sheen.*

straw-brown color can also be quenched for browning or if the part is on a color case-hardened lock. Quenching in oil halts the color and makes the finish more durable.

German silver and brass look best if just brought up to a nice polish. Use needle files if any shaping is to be done in close places. Aluminum-oxide in 320 grit will remove most scratches. If you want a high gloss, use the Dremel Moto-Tool with polishing points and felt bobs charged with Brownell's Polish-O-Ray 400 compound.

Four aught steel wool, if used with light pressure, will burnish both metals to a nice, velvet-like gloss. You can use cartridge-case cleaner to clean brass or just dip it in the ten percent muratic acid for slightly better results.

The best metal polishing compound on the market is Simichrome, available from Brownell's. It is a very mild abrasive cleaner and polisher compound. Used with four aught steel wool it will remove fine scratches. Switch to some on a piece of cloth and it will remove finer scratches. By decreasing pressure you can polish the metal as bright as glass.

The problem with brass is not in polishing it, but keeping it from turning brassy green. Actually, if you want the antique appearance, just lightly polish the brass with a clean cloth. Remove the green crud but leave the antique tarnished coating. The only way to keep brass shiny is with a protective coat over it. You can use clear, model-airplane dope as the coating. A thin layer of lacquer also will work. Polyurethane stock finish in spray cans will put a good protective coat on the brass, but the brass must be clean and free of wax or polish.

While a reproduction-replica kit's main purpose is to allow the owner to build and finish his own gun, sometimes you have to be realistic. The metal preparation is within the realm of even the simplest of tools and close working area. If the bluing or browning operation presents a problem that would necessitate abandoning the project, there is still a solution available.

The kit builder naturally wants to do all of the work himself. He can do all of the steel and iron hand-polishing right up to the point of applying the finish. The majority of professional gun shops have a special extra-low bluing price for pre-polished work. It is surprisingly low as their main expense is in the time required to polish a gun. So, you just finish the polishing, apply a light coat of oil to prevent rusting and the gunsmith runs it through his tanks along with other guns. Ask for the gun back disassembled and the price will be even lower.

You should deliver the gun totally disassembled and with a list of the parts. The gun is returned the same way, disassembled but blued and with a coat of heavy oil. Guns blued commercially should not have this protective coat of oil removed until twenty-four hours have passed from the time they were oiled. It is a special oil that soaks deep into the pores of the metal. Use any cleaner, such as mineral spirits, to remove the oil and lubricate the gun as you reassemble it. Do not put the gun in a zip-up type of case. Allow it to remain in the open air and you will note that several coats of oil will be required before the metal ceases soaking up the oil. If put in a zip-up case, the metal usually will dry and start to rust.

Correct metal preparation, browning, bluing and other finishes is an art in itself. In fact, you can earn an engineering degree in metal finishing! While knowledge and procedure are well known, the only way you can really learn the fine points of metal finishing is by repeated practical application.

CHAPTER 11

# MARKWELL ARMS'

## LOYALIST TARGET PISTOL

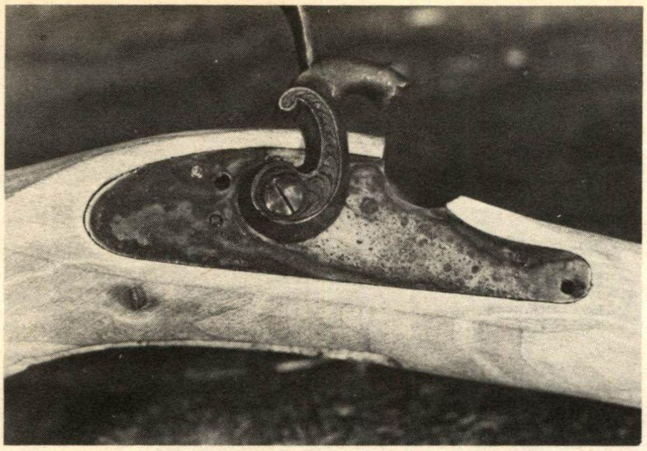

This Interesting Single-Shot Percussion Pistol Kit Is Characteristic Of Dueling Pistols

FEW OF TODAY'S handgun target shooters realize that much of the beginning of the sport can be traced directly to a nonsporting event known as the Code Duello.

The history of settling disagreements or affairs of honor by dueling is somewhat hazy. Perhaps it began in the days of the caveman, when two individuals selected a choice rock and, at a signal, tried to change the thoughts of the other with the rock directed forcefully at the noggin. It was all based on the idea that right would prevail over wrong, or simply that the better man would prevail.

It is well known that William the Conqueror brought trial by combat to England in 1066 and that the law was not repealed until 1819; throughout this period the rough and rowdy affairs started to pick up a few rules along the way. Civilization tends to avoid the idea, or at least shade it, that might makes right. So the rules became more complex and with them an attempt to make the two parties more evenly matched.

The first recorded duel with pistols occurred on horseback in Switzerland in 1659 using wheel locks. The pistol rapidly grew in popularity for it minimized size, strength and agility. Skill was required, but not to the extent of daily fencing lessons with sword. A little occasional target practice was all that was required. The use of pistols and Code Duello lasted much longer than is commonly realized. While any two similar pistols could be used, most were specifically made for the purpose and were contained in an elaborate case. Flintlocks were most



*Sparing use of scraper brought lock plate recess to point of full metal seating. Wood surface is slightly higher than surface of lock for finishing.*

common, percussion locks abundant, and even a few cartridge versions are known to exist.

The rules varied from nation to nation, even in regions of the same country; however, there obviously were two basic schools of thought. With one school, just standing about twenty paces from an opponent and going through the ritual sufficed, even if no blood was shed. The other school subscribed to a more permanent settlement, even if several attempts were necessary!

To the first group the smoothbore barrel was entirely satisfactory. The second, more determined group utilized every device possible for accuracy, including precision rifling, target-type sights and set triggers. To achieve maximum accuracy and skill, training schools, shooting clubs and practice galleries were established. These varied, of course, but many had elaborate man-size targets with scoring circles around vital areas. They were, in close respect, not too much unlike our modern, turning silhouette targets.

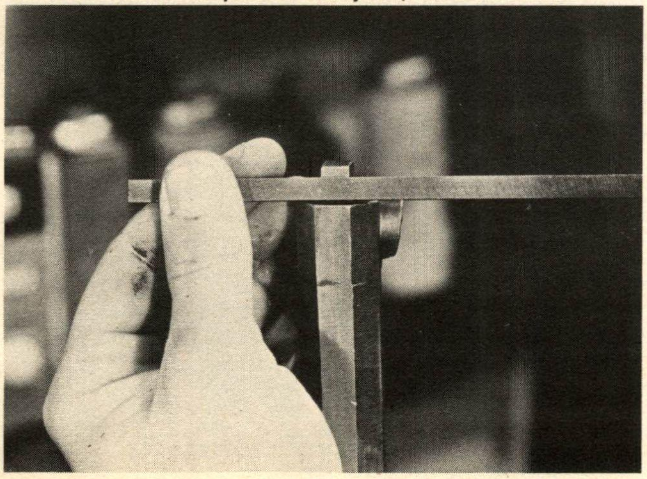
As Code Duello ceased or slowed down, many galleries remained in operation. The afternoon of practice and the scoring circles where skill could be measured in score rather than blood slowly became sport rather than the original purpose. It is not difficult to see how this evolved, in many instances, into target matches between various clubs.

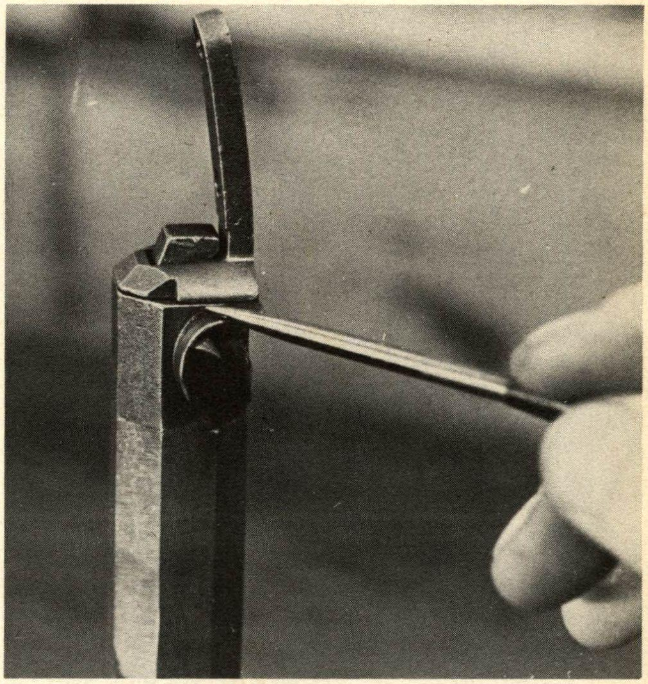
Markwell Arms Company's Loyalist Target percussion pistol is not an attempt to duplicate an exact dueling pistol. As they correctly state, it retains the character of the dueling pistol but incorporates modern manufacture. In this respect it succeeds, and is one of the most interesting single-shot percussion pistol kits on the market.

The rifled ten-inch barrel is stamped .45 caliber, but a slug pushed through the bore miked .442 across the barrel lands. This would coincide with Markwell's recommendation of a patched .433 ball, which, incidentally, they offer in bags of one hundred each.

The front sight is brass with a round-bead top that dovetails into the barrel. The steel rear sight is fully adjustable for windage and elevation. The rear-sight base attaches to the barrel with two screws. The breech plug is heavily threaded, screws into the rear of the barrel and actually becomes the last inch of the octagonal barrel, and has a cupped recess for the nipple. The back of the plug hooks into the separate tang in the patent breech-type system. The front of the barrel is retained by a wedge. The barrel's bottom rib is permanently attached to the barrel, while a screw holds the single, brass ramrod thimble to the rib.

*Narrow pillow file shapes male breech plug extension. Barrel is mounted in padded vise jaws, muzzle down.*

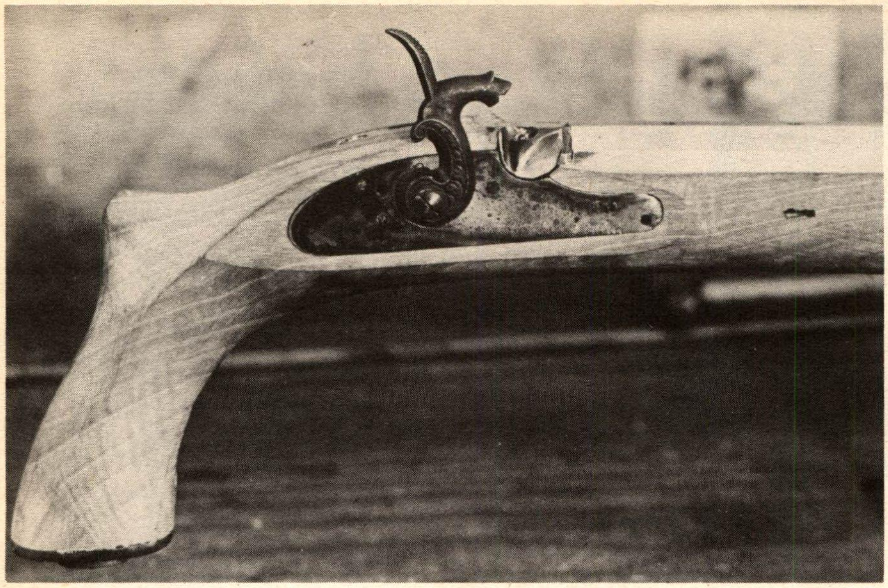




*Correct initial fitting of male breech plug extension to female plug recess should leave small gap, at pointer, for final wearing in and firm fit.*

The fully adjustable rear sight and front bead – plus an easy cleaning by simply pressing out the wedge and lifting the barrel up and out of the stock – leaves little to be desired in the barrel design. The lock is color case-hardened and, although fully functional as received, can be improved with hand stoning for smoother operation; in fact, Markwell recommends this step in their instructions.

The adjustable double-set triggers are unusual in operation. The first pull on the rear trigger sets the trigger

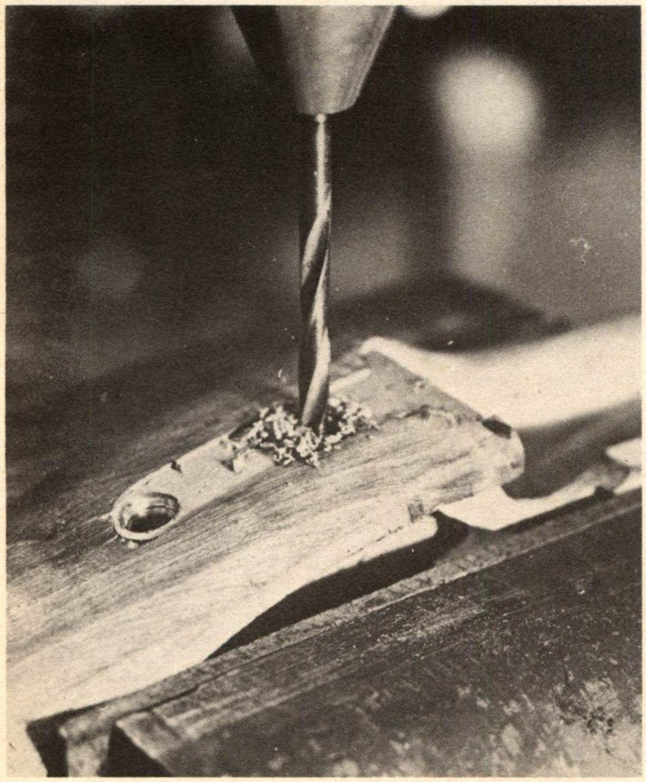


*Text describes problems encountered with first test fitting of tang and barrel to wood stock. Note how nipple shield fits directly against lock plate. Small imperfection prevented tang from moving fully to the rear and was corrected.*

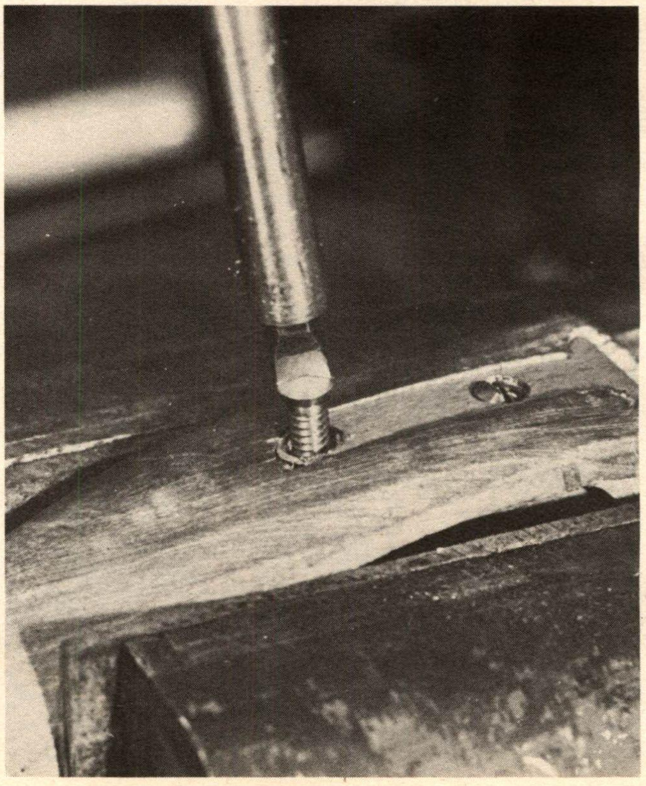
mechanism on safe. No amount of reasonable pressure on the front trigger will cause it to disengage and strike the lock sear bar. In the safe position it also locks the trigger down, preventing engagement with the sear bar from spring tension; which, otherwise could possibly keep the sear in the lock from fully engaging the half-cock notch in the hammer. To fire, the hammer is brought to full cock and the rear trigger is pulled a second time; which sets the front trigger in usual fashion and disengages the trigger safety. A light touch on the front trigger releases the trigger mechanism in normal set trigger function. It is a well-designed trigger with an added safety feature and, with a little practice, is as fast as any set trigger. A screw adjusts front trigger tension and amount of pull.

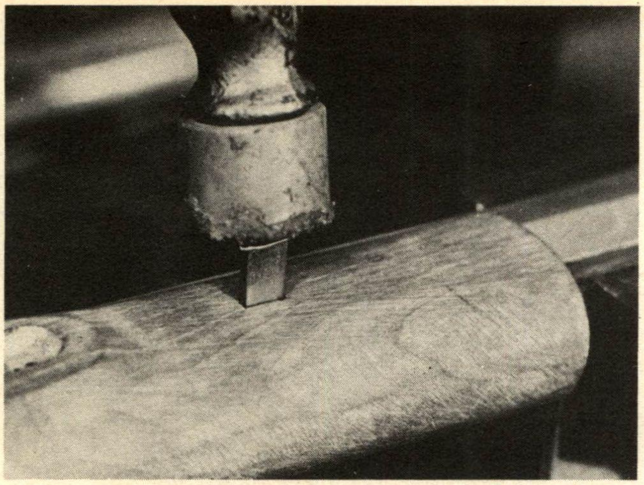
The walnut stock is ninety percent inletted and is of the saw handle-type design. This was a design quite often used on dueling pistols and common in modern black powder single-shot target pistols. The bottom of the pistol grip is capped with a multi-step steel cap secured with a screw. The brass trigger guard is of the finger-hook design. Ramrod is brass tipped, the tips secured by a crosspin. Brass barrel wedge plates add to the overall appearance.

*Pilot holes for large tang retaining screws are drilled into stock with correct size drill using tang as guide.*



*Correct screwdriver blade for screw is essential. Here, Brownell's Magna Tip blade has both correct slot width and depth, tightening without damage.*





*Metal barrel wedge is tapped into place with plastic head hammer. Fit of wedge must be friction tight, without damaging or splitting stock wood in process.*

Assembly of the Loyalist kit varies somewhat from the average single-shot pistol kit, but the basic principles remain the same. As is true of all phases of gunsmithing, once you learn basic principles, the variations will present few problems that you cannot solve. As with all kits, the first step is to read the manufacturer's instructions thoroughly. Next, examine and identify each part and component until you know exactly where each is to be assembled to complete construction of the gun. With the Loyalist pistol, I would recommend that you closely examine the function of the unique set-trigger assembly.

As I have previously stated, the sequence in which I assemble a kit may vary from the manufacturer's instructions. It is not a matter of who is right and who is wrong, as both procedures are correct. It is simply a natural tendency to follow the sequence you have been taught to follow and have used for many years.

With a lock plate recess as closely pre-inletted as the Loyalist, there is little room for variation if the lock and barrel do not align. While not necessary with this kit, it is possible to slightly alter the barrel inletting. The walnut stock of the pistol is close-grained and dense, which necessitates the use of inletting black to achieve a good wood-to-metal fit.

Place the hammer on half cock and align it with its pre-inletted recess. On the sample kit the lock would not fully seat on the first trial. With inletting black thinly spread on the lock's surface and a second attempt made to seat it, the wood was clearly marked. Only a light scraping with a flat-end scraper was required and the lock seated firmly with no gaps. Throughout the entire assembly of the kit, this same tight inletting was obvious.

I personally prefer this close pre-inletting as opposed to a loose inletting where the parts fall into place. The latter system invariably leaves small but obvious gaps. A scraper should be used carefully to remove loose slivers of wood that would otherwise obstruct the seating of parts and components. Take care not to remove any wood on the edges of the inletting until the part is being installed.

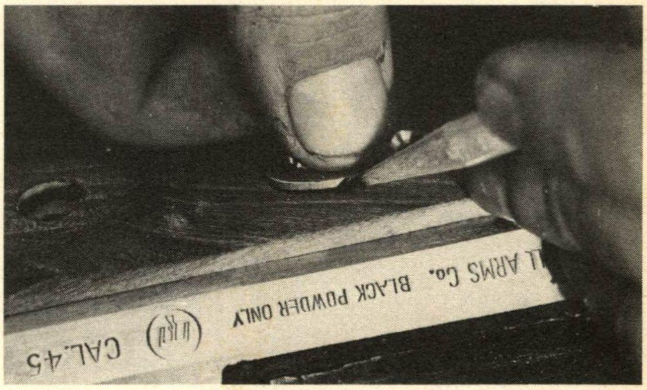
The side-lock screws have good threads and the pre-installation check of trying them in the lock plate revealed excellent fits. Incidentally, the two screws are different in size. The larger screw goes to the rear of the lock, the smaller to the front. The two brass side-lock washers also differ in size, so be sure to install each in the correct pre-drilled recess. The larger screw would not pass freely through the stock. A small amount of filing with a round needle file enlarged the screw hole, then the lock, screws and brass washers aligned perfectly.

Next, the barrel tang must be fitted to the male hook on the barrel breech plug. Press the two parts firmly together several times but without using excess pressure. This repeated hooking of the two parts will mark the points that prevent a close fit. Remember that with all patent breech-barrel arrangements, metal is removed from the female tang recess only if burrs or rough metal are present.

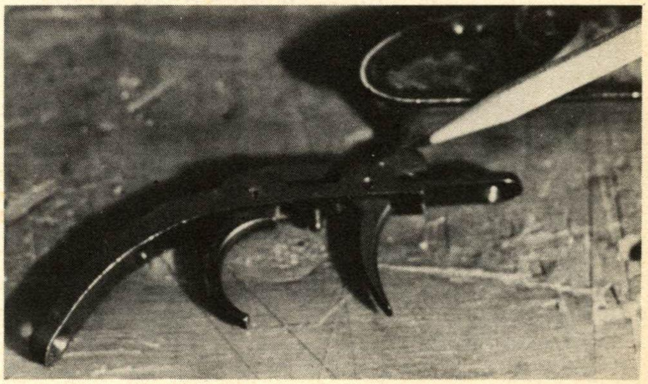
With the barrel breech-plug hook marked, secure the barrel vertically in a padded vise, muzzle end toward the floor. Use a narrow pillow file to remove a small amount of metal from the marked spots on the hook. In this case it was necessary to remove metal only from the bottom of the hook and the upper inside angle. Go slow! Remove only a small amount of metal and then try the tang to see how much more must be removed, and where. Remember to leave a very thin gap at the bottom to allow for wear. Removing and reinstalling the barrel during construction usually will finish this matching of parts. If not, you can always file some more.

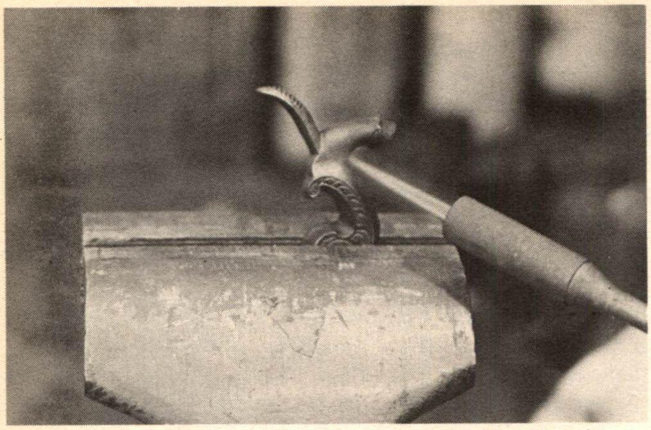
An old trick in fitting two metal parts together is with the use of soot from a flame. A common candle works fine. Just clean the metal of all oil, then hold it about an inch

*Markwell kit did not pre-recess wood for brass wedge plates. Plate is positioned and pressed to wood as outline is made with sharp-pointed pencil, as shown.*

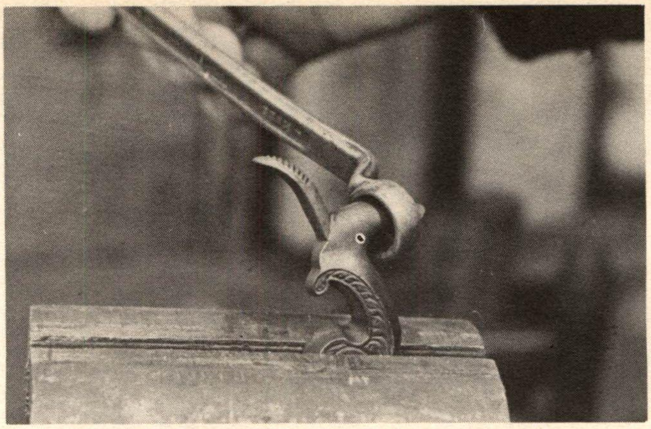



*Pencil point indicates top of front trigger which must not contact sear bar when installed in stock.*





*Hammer nose is heated by applying propane hand torch flame directly to front of thumb piece. Metal is evenly heated all around before bending is attempted.*



*Box end wrench slipped over nose of hammer applies leverage to bend into proper contact with nipple. Hammer is bent while hot and not quenched to cool.*

above the flame. The carbon soot will deposit on the surface of the metal part. When fitted with another part, the high spots on the soot-covered part will come out clean, while the low spots or sections will retain the soot coating. It is the opposite of the inletting black process, where the coating is transferred to the other part. The soot is removed by the other part, revealing bare metal at the high binding points.

With the tang and barrel properly fitted, the tang is next to be installed on the stock. This kit required only a light cleaning-up of the pre-inletted recess; however, the tang would not fit snugly. Close inspection revealed several uneven machining marks on the tang. A few cleaning strokes of the file and the part went snugly into place. This is a perfect example of the fact that removing more wood is not always the correct solution. The metal component may require just a cleanup to achieve a perfect fit.

Next the barrel was hooked into the tang recess and, while holding the tang in position, the barrel was lowered into its inletted channel. Again, a slight scraping of the barrel channel and the barrel rib recess was necessary for the barrel to fully seat. Raising and lowering the barrel several times resulted in as close a fit as could be desired. Finally, the barrel wedge was carefully tapped through both sides of the stock and the tenon, which is permanently attached to the barrel.

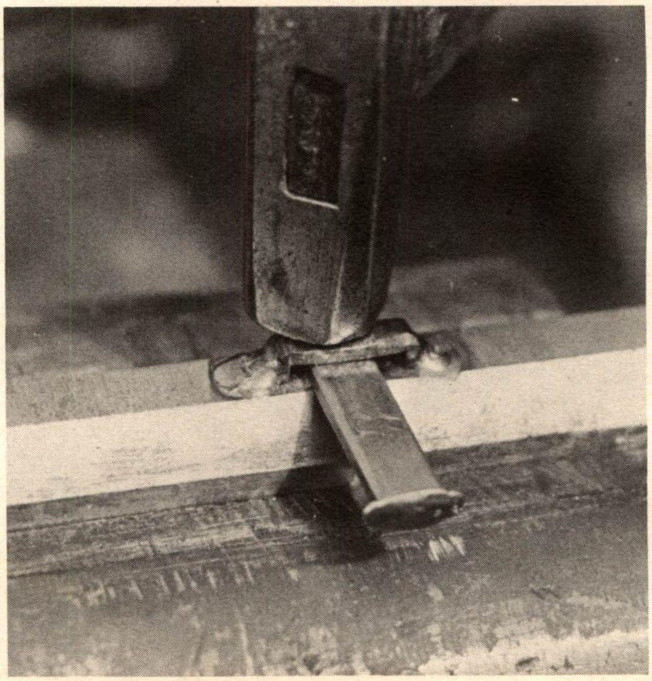
The Loyalist kit uses two large wood screws to secure the tang to the stock. Remove the barrel. Make sure the tang is fully back and firmly seated. Using a center punch, locate the center of the tang holes and tap the punch to mark the wood. Next, select a drill smaller in diameter than the wood screws. Use a hand-powered drill, not an electric drill. Leave the tang in place to help you drill the two holes straight. With the holes drilled, select a correct screwdriver that fits the screw slots and seat the two screws. This should be a tight fit.

As previously stated, the barrel tenon is permanently attached to the barrel. The hole through the tenon is larger than the wedge to compensate for barrel-channel inletting variation. On this specific kit the barrel seated deep and allowed barrel movement up and down with the wedge in place. To eliminate this, the hole through the tenon had to be decreased for a closer fit to the wedge. The barrel was placed in a padded vise, belly up. The tenon was heated cherry red with a handheld propane torch. Holding the wedge in place, the top of the heated tenon was tapped with a hammer until its slot thickness matched that of the wedge. It was allowed to cool normally. When reinstalled in the stock and the wedge inserted, all barrel slack was eliminated.

With the barrel securely seated in place, the lock would no longer fit into its recess. On the Loyalist pistol the bottom of the nipple shield is rounded and fits into a matching arc in the top of the lock plate. A three-quarter-inch grindstone in a Dremel Moto-Tool was used to grind the lock-plate arc back until the two components again matched and the lock would fully seat in its recess.

The nipple was installed next to check its alignment with the hammer. On the sample kit the alignment was off considerably. The usual procedure is to inlet the lock

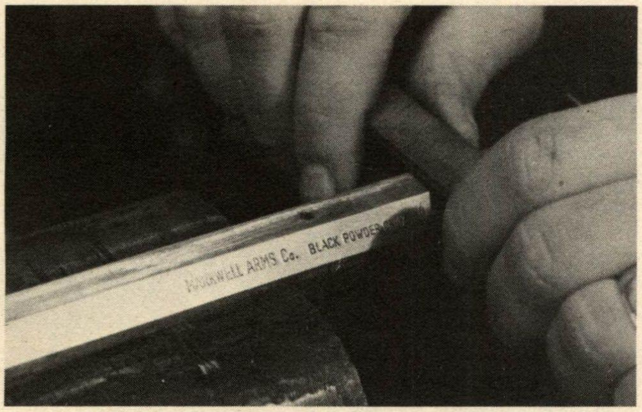
*After heating barrel tenon with torch, wedge is placed under tenon and hammered into tight fit of two parts.*



deeper. In most instances this is all that is necessary. In this case it was not sufficient; also, the hammer face was touching the top of the nipple at an angle.

Most modern kit builders are under the impression that heating and bending a hammer to the correct angle is a major task. When muzzleloaders were more common, this was just a part of everyday gunsmithing. Hammers are held to the tumbler, which contains the sear notches and passes through the lock plate, by a square pyramid with a flat top. A matching tapered square is in the hammer, a large-headed screw holding the two together. A try-hammer was used to obtain the correct position of the missing or broken hammer. Set screws allowed an adjustable square to be correctly positioned, then locked in place. The inward angle of the hammer and the hammer nose also were adjustable on the try-hammer. Once the try-hammer was correctly set, a blank hammer was drilled, the tapered square cut and the hammer filed and bent to match the try-hammer settings.

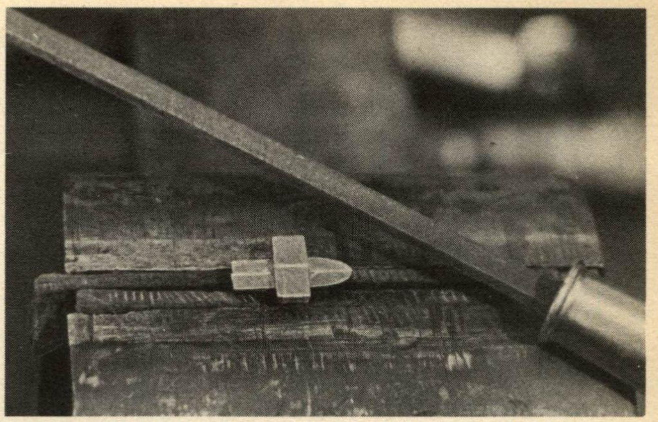
To bend a modern hammer, first carefully note how much it must be bent inward and in what direction the nose must be bent to seat squarely on the nipple top. Then



*Careful draw filing will shape flats of gun barrel.*

unscrew the hammer-retaining screw three-quarters of the way. Holding onto just the hammer, let the lock hang free. Several taps on the hammer screw with a plastic mallet or block of wood usually will jar the hammer loose from the pyramid-shaped tumbler seat; after which the screw is removed and the hammer is freed. If this does not work, insert the thin blades of two small knives on opposite sides of the hammer. A light tap on each will press the hammer up and off the tumbler.

With the hammer free, select a boxend wrench that will just slip over the nose of the hammer. If a wrench is not available, drill a similar-size hole in a one-quarter-inch-thick piece of steel and round the edges of the hole. With the hammer held securely in a vise, heat the front of the hammer cherry red all the way back to the thumb piece. Slip the boxend wrench or homemade tool over the nose of the hammer. Slowly bend the heated section inward – slowly! Reheat and reposition the wrench to bend the hammer nose down or in the desired direction. Again, slowly! If the hammer will not bend, it is too cold and must be reheated. When finished, allow the hammer to cool in its own dear time! Try it on the lock. With the Loyalist hammer, two heating and bending sessions were necessary.



*Casting marks on bottom of front sight are carefully cleaned up with narrow pillow file. Note padded vise jaws.*

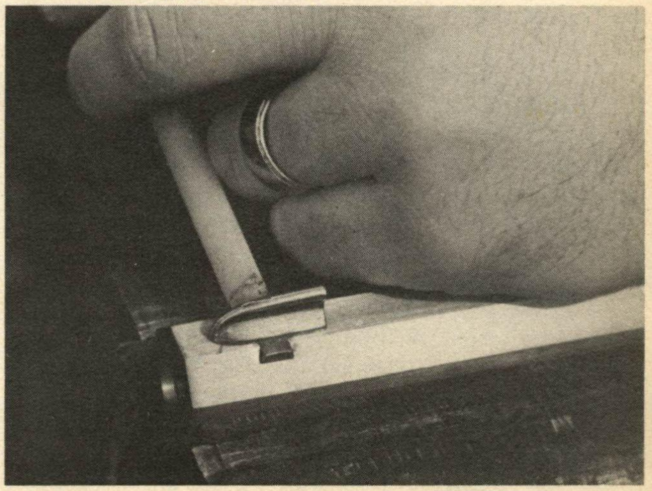
It is best to make too little of a bend than too much the first time.

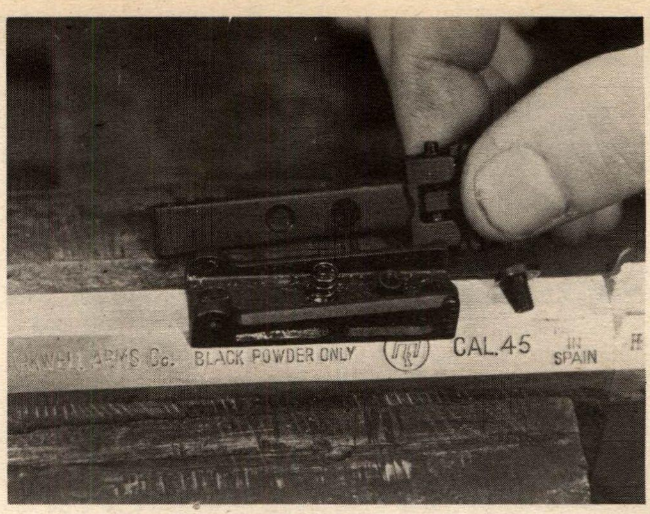
Do not use pliers, hammer blows or a hammer and punch combination. The bending tool allows you to feel the metal bending and you also can control the bending more precisely. Pliers can deform a hammer. A hammer, or hammer and punch also can deform, plus the metal may be too cool and break. Remember, cherry red-color heat, bend slowly and allow to cool normally. There is no trick, just knowledge and correct procedure.

Testing results of the bending is simple. Check to be sure the barrel is clear and secured to the stock, and also that the lock is tight. Place a No. 11 percussion cap on the nipple, cock the gun and reach up into the trigger recess with a screwdriver and trip the sear bar. The hammer should fall and fire the percussion cap. Obviously, no powder load is used.

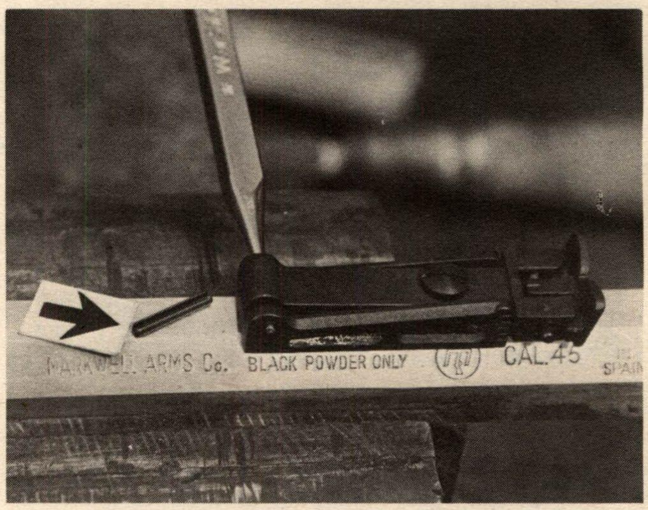
If the hammer will not fire about six percussion caps successively without failure, the hammer is not bent correctly. This test also assures that all components of the lock are working freely. Should the hammer strike the percussion cap and not fire, note its forward movement as it falls. If it's sluggish, some wood may be binding the lock. Coat all lock parts with inletting black and cycle the lock,

*Nylon punch will not mar metal surface while brass front sight is tapped into shaped barrel dovetail.*






*Adjustable rear sight base is affixed to barrel with tension spring recess forward and elevation screw hole to rear. Arrow, below, indicates sight cross pin which is inserted through top and bottom components of sight after pin punch aligns holes, as shown.*




without a percussion cap, then remove the lock. Look for inletting black marks in the lock-mechanism recess. Make this check before bending the hammer any more, as binding may be the problem, not the hammer.

Most kits have short, side-plate screws that barely secure the lock. The Loyalist's two screws are purposely too long. With the lock pulled up tight, use a needle file to cut a notch in the protruding screw, two threads above the surface of the lock plate. Remove the screw, grind or file the excess off down to your mark, and slightly round the end of the screw. Reinstall and if it still protrudes, remove and file off one thread. Repeat until the screw end is flush with the surface of the lock plate. If you file too much, remove the brass washer, deepen its recess and reinstall the screw, pulling screw and washer deeper into the stock. Carefully executed cut-and-trial methods at the beginning will prevent this step from becoming necessary.

Once the barrel assembly and lock assembly are properly fitted to the stock, the next assembly job is the trigger. Make the usual preparation of cleaning out any wood slivers in its pre-inletted recess. Do not remove any wood other than this before trying the trigger assembly in its recess. On the first try, the assembly should be seated almost to its full depth. A light scraping of wood on the walls of its recess was all that was necessary for it to seat fully. Now comes a very important test.

Secure the barrel at the muzzle in a padded vise with the rest of the pistol extending and horizontal. Hold the trigger assembly in place with a large punch, without the trigger on safe or set, and pull the front trigger. The hammer should be fully down. Slowly pull all the way back on the trigger. You should not feel it touch the sear bar of the lock. Repeat on half cock and full cock. You should not feel the trigger touch the sear bar. This gap between trigger assembly and sear bar is necessary. When the trigger is set and then released, spring action flips the trigger fly up to strike the sear bar and trip the lock. If the two are touching, this cannot occur and the sear bar will not trip.

With this kit, no alteration was necessary. If it does occur, it will be necessary to file or grind some metal from the bottom of the sear bar to provide the necessary clearance between the top of the front trigger and the sear bar. It is also essential that the sear bar not touch wood when the hammer is full down, or on half or full cock.

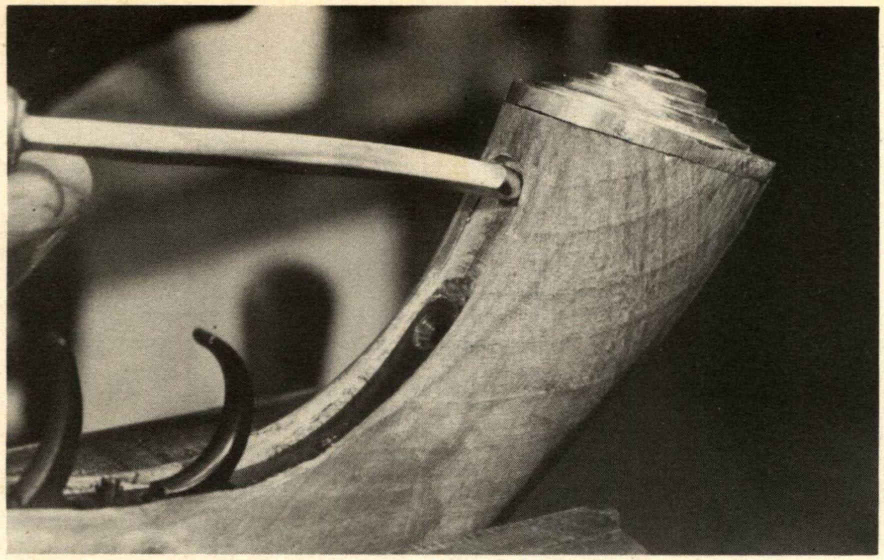
With trigger assembly properly seated, mark its two holes with a center punch. Use a small-diameter bit in a hand-operated drill to make the pilot holes for the two wood screws that hold the assembly to the stock. The two screws are tightened alternately; a few turns on one, switch to the other and then repeat. Both screws seated this way assures equal pressure. Pull them up tight. Now retest the trigger assembly. If all is well, try putting the trigger on both safe and set to assure their function. If this is correct, try firing the gun with percussion caps only; no powder load. The final front-trigger adjustment screw can be set later during actual test firing.

Next item is the brass trigger guard. With a flat file, smooth the casting on the bottom. Remove only enough metal to make the surface flat. Check the edges that will fit into the pre-inletted recesses for burrs and bulges in the brass casting. If any are present, remove them with a file, but do not decrease the main width.

Ease the front end of the trigger guard into its recess, if possible. In this instance, it was only necessary to lightly file the sides to remove the casting imperfections. This section fit perfectly.

The rear end was a different story. The casting was approximately three-eighths-inch too long to enter the inletted recess. The front end was removed from its seating and the sides of the rear of the trigger guard filed to remove casting imperfections to match the inletting recess. Attempting to bend a brass casting is risky business. While holding the trigger guard in place, the sides and end at the rear that would require more inletting were marked with a sharp pencil.

Use a sharp chisel, hand pressure only, to make the side cuts up to where the curved end begins. Remember that the pencil mark is the outside of the trigger guard! Make your cut inside the line. Actually, the cut is best if a hairline of wood gap is between the cut and the pencil line. Use a gauge – half-circle – chisel close to the size of the rounded end of the trigger guard to make this cut. Now make an angle cut toward the first cut, which was straight down. This will make a small trough of removed wood. Now use a



*Curved tip wood gouge is used to lengthen trigger guard rear extension in pre-inletted stock.*

small square-end chisel to remove the main section of wood. Try the trigger guard in the lengthened inletted recess.

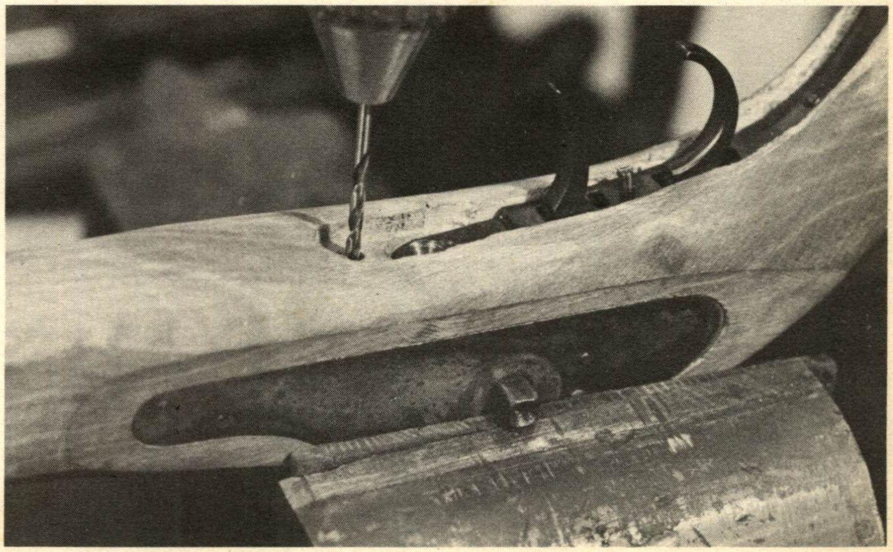
Inletting black on the trigger guard will help. It is the same old cut-and-try system until the rear of the trigger guard seats properly. The front and rear of the trigger guard have pre-drilled screw holes. Use a center punch to mark and indent the wood for the pilot hole. Select a small, hand-powered drill bit that will make a good pilot hole but allow the wood screws to bite into the wood. After drilling the two holes, install and pull the screws up tight. Again check the function of the set-trigger assembly and lock to assure their correct function.

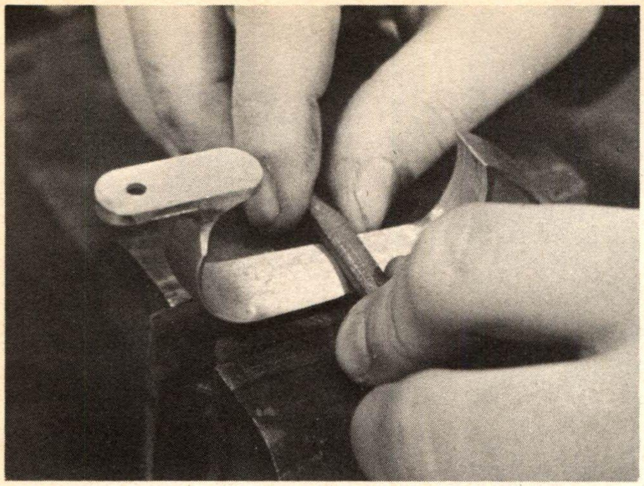
The two brass wedge plates are the next items to be assembled to the stock and will require full inletting. Press the wedge firmly into position with the barrel in its channel. Note that the wedge plates have two pre-drilled and countersunk holes for retaining the wood screws. Be sure the countersunk holes are on the outside and slip the plates over the protruding wedge. Pull down on the wedge plate as you press it against the stock. When inletted, the wedge plate will help hold the wedge in place. With a sharp-pointed pencil, trace around the edges of the plate as close as possible. Remove wedge plate, wedge and the barrel.

Use an angle-bladed chisel or the point of a thin-bladed, sharp knife to make the first downward cut. Again, remember that the cut is made inside the pencil mark, leaving a little hairline of wood between the cut and the pencil mark. Next make an angled cut toward the downward cut to remove a small trough of wood around the edge. This acts as a boundary and allows you to remove the wood in the center faster with a regular chisel. Use inletting black on the wedge plate to mark the wood. Work slowly, making a precision inletted recess for the wedge to fit to full depth with no gap around the edges. For this close work, Brownell's small carving chisel set is ideal.

With the wedge plate recess inletted, press the plate in position and drill the pilot holes to seat the two brass retaining screws. Install the wedge and test the results. Now repeat the same inletting process for the other wedge plate. When the wedge is installed, it should be tight. If the wedge will not pass through both plates, the top of the wedge plate slot may be too low. Use a flat needle file to relieve the protruding brass, but keep the wedge tight. When fully installed the end of the wedge may protrude too much. It can be cut back, but allow about one-sixteenth-inch to

*Hand-powered drill, not electric, is used to drill pilot holes in stock forward of trigger assembly.*





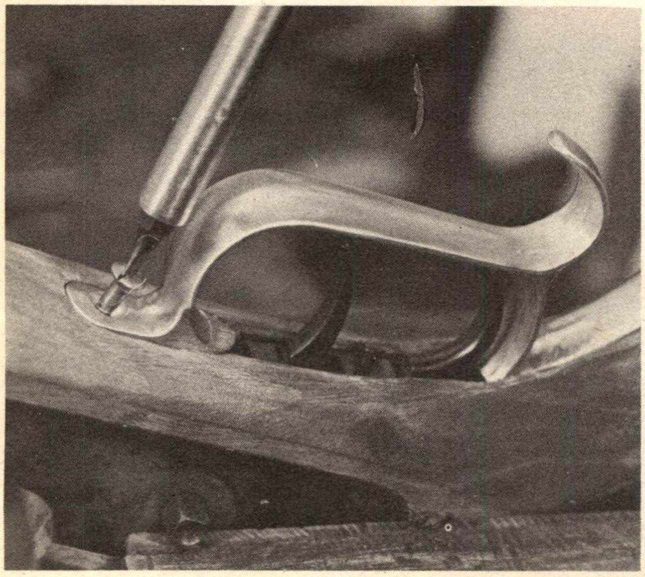
*Casting marks and other irregularities are removed from brass trigger guard with narrow pillow file.*

protrude for easy removal. Lightly rounding the edges of the wedge end will make installation easier.

The front sight is a one-piece brass blade with bead on top and a male dovetail on the bottom. The first step is to clean the casting, specifically the male dovetail. Remove only enough metal to flatten the bottom and remove the rough casting marks from the angled sides. Do not file too much as the female dovetail in the barrel is already closely cut, and will require only a pass with the sight file to remove metal burrs. Smooth the sides of the sight blade, but be sure to keep the bead on top of the blade round, and flat on the rear. Needle files are best for shaping the top of the sight, followed with aluminum oxide cloth. The area is too close to use the Dremel Moto-Tool and polishing point.

Using a punch, tap the sight in from right to left. If the fit is too close, lightly file the sloping sides of the sight dovetail. It should tap into place firmly and in the center of the barrel. Remember that the rear sight is adjustable for

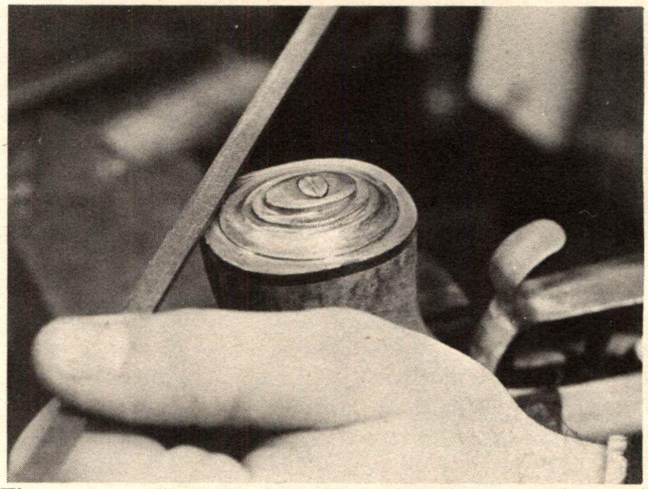
*After filing, brass trigger guard takes on a fine burnished appearance as wood screw is tightened down.*



elevation and windage, which usually eliminates the need for moving the front sight right or left to zero the pistol.

The rear sight is already blued like the trigger assembly, so care should be taken to prevent marring the finish. The base of the sight assembly is contoured to match the octagonal barrel, and is attached to the barrel with two metal screws. Holes for the sight base are pre-drilled and tapped in the barrel. The easy way is to place both screws through their holes in the sight base. Now, lower base and screws until they align with their holes in the barrel. Tighten each about two turns, press the base down firmly on the barrel and finish tightening the screws. This little trick also prevents cross-threading of the screws, which often happens if you fully seat one screw and then try to install the other screw.

Note that about the middle of the installed sight base there is a hole drilled through the base, showing the barrel underneath. Farther to the rear is a threaded stud. Place the sight spring in the hole in the base. Now carefully position the sight plate over the spring, the other end of the spring entering the small recess in the sight plate. Press the plate down fully and the stud on the base will protrude through the sight plate. Install the large-head elevator screw into the



*The narrow pillow file is again used to shape and contour the steel grip cap. Care must be exercised not to damage steps. Aluminum oxide cloth is next.*

threaded stud. This holds the plate fully down. With a small punch, line up the hole across the front of the plate with the two holes in the ears at the front of the base. Now drive in the split pin until it moves the punch out of the way and secures the front of the sight plate to the base. Turn the small screw on the side of the sight plate until the sight blade is centered.

In operation, if your bullet is hitting low loosen the elevator screw. The spring raises the rear sight and, on the next shot, the point of impact will be higher. If the bullet is hitting right, turn the sight-blade adjustment screw to move the sight blade to the left and the bullet will strike more to the left on the next shot. Naturally, powder charge, bullet weight and other factors affect accuracy. If these are consistent, good accuracy is possible and the adjustable sights eliminate a lot of problems.

The brass ramrod thimble should be checked for burrs that would prevent it from seating properly on the barrel's bottom rib. Try the retaining screw in the pre-drilled and

*Six-inch single cut file shapes female tang of patent breech to match contour of wood stock.*

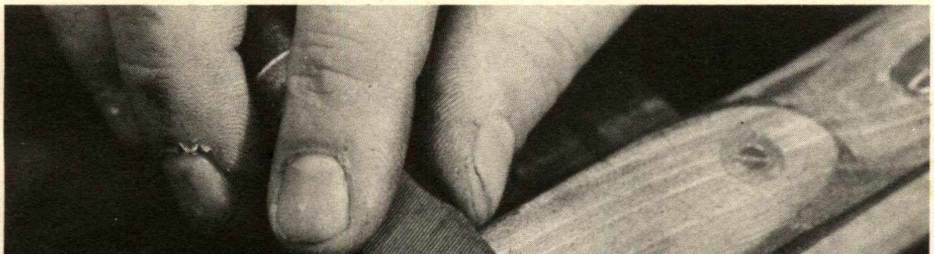
tapped hole and check to be sure there are no burrs around the hole in the rib. The retaining screw passes through the large hole and into its countersunk hole inside the thimble. Pull it up tight in its pre-drilled and tapped hole in the barrel rib. Check to assure the thimble hole is aligned with the ramrod hole in the stock.

The wood ramrod has two brass end caps secured with pins. The rounded brass cap goes to the rear, the flat brass cap to the front. Select a small drill for the retaining pin hole in the wood and chuck it in a hand drill. Each of the brass caps have a pre-drilled hole in one side. Select one of the caps and press it on the turned-down tip of the wood ramrod. While firmly holding the cap, drill the pilot hole until you feel the bit passing through the wood and touching the brass on the other side. While the pin will hold the ramrod to the cap, if you fill the cap with epoxy glue the unit will be more secure. Press the cap on the ramrod tip, wipe away the excess glue and line up the pilot hole. Tap the pin in until it is flush with the brass cap's outside surface. Repeat the same procedure with the other brass cap. When the glue is dry, lightly file the ends of the retaining pins until they match the contour of the brass caps.

The kit is now assembled and functional. If you wish, you can test fire to assure correct function. This always is a good idea at this point, for if something is wrong it is best to discover it now, rather than when the final finish has been applied. The manufacturer recommends a starting load of 25.0 grains of FFg powder and a lubricated patch ball .433 in diameter. About two test shots are all that is necessary. Clean the barrel.

You are now ready to shape and sand the stock and prepare the metal for final finishing. While the original lines of the stock are good, remember that this is a target pistol. Therefore, the wood shaping should be done in such a way that the pistol feels as comfortable as possible in your hand.

The wood shield around the lock plate is a good place to start. Hold a sharp pencil at an angle to mark the wood



*Single-cut file also is used to shape wood and left side washers. Finished surface of wood, brass washers and lock-plate screws should become smooth to touch.*

*Half-round fine-cut wood rasp shapes pistol grip section, blending stock material and grip cap into one surface.*

around the edge of the lock plate as previously described. Remove the lock plate but not the barrel. With a good, flat-metal file, start removing the wood by draw-filing. The nipple shield attached to the barrel must also be filed at the same time. Keep wood and metal flat, using your marked pencil guide as the stop line on the wood. Again, follow the cut-and-try method until the wood surface, lock-plate surface and barrel-nipple shield are equally level.

Remove the lock plate and nipple from the barrel. Use a metal file to shape the wood and tang until they are level. By carefully draw-filing, blend the rear end of the barrel with the tang. The heads of the tang screws will be filed to match the contour of tang. In doing so, it may be necessary to deepen the screw slots later, but before the parts are blued.

Next use a small metal file to shape the contour of the brass trigger guard while it is held in its recess. Blend wood and brass to an even contour. Remove the brass trigger guard and, with needle files, remove the rough casting marks and contour the trigger guard. Final finishing is done while the stock is being sanded, and then the trigger guard is polished with the Dremel Moto-Tool. Reinstall the trigger guard.

When the front of the trigger guard was filed while in place, you will have created a slight dip in the wood. Use rasp and metal file to straighten the bottom of the wood forend. If you wish, you can taper it lightly toward the tip.

Reinstall the lock plate and pull the screws up tight. With a large file, flatten the left wood shield the same as you did on the lock-plate side. File wood, lock-plate screw heads and the brass lock-plate washer at the same time until all are flush and level.

Remove the barrel wedge and barrel. Use rasp and file to shape the front end of the stock. Leave the brass wedge plates and screws in place, blending them with the contour of the stock. The forend can be contoured to personal taste; the only rule being to make its lines as graceful as possible to blend with the rest of the stock.

The grip cap is a rough, steel casting held in place with a screw and two pins to prevent it from turning. With the stock held in a padded vise, belly up, use needle files to

*Wedge plate screw heads have been aligned fore and aft before smoothing with single-cut six-inch metal file.*

remove the casting marks. The cap has a series of steps, and you should use needle files to accentuate the steps, keeping them flat. Finish polishing is accomplished with narrow strips of aluminum oxide cloth.

With the grip cap-end surface completed, start shaping the pistol grip to fit your hand comfortably. The middle finger fits into the brass hook on the trigger guard, leaving only the ring and little finger on the wood grip. Actually, it is a comfortable grip, placing the trigger finger in correct position to touch the front set-trigger. This type of trigger guard and grip once was quite popular with target shooters, but will require a little practice by modern shooters before it looses its initial awkward feeling.

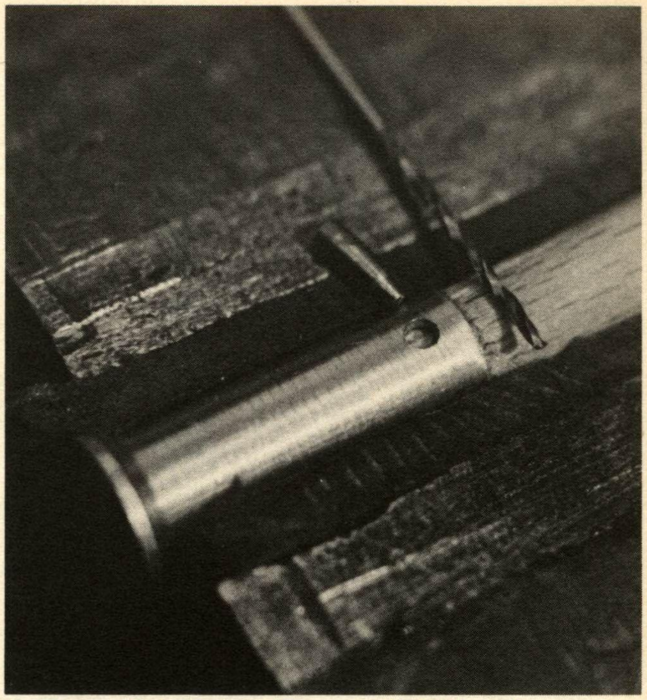
The wood is now ready for final sanding. The brass parts, grip cap and tang can be left in place until all sanding is completed. Remove them just before the stock whiskering operation. The walnut in this stock was quite plain, with little natural figure. Herter's French Red filler and stain were used to fill the pores and give the stock a nice color. This filler does an excellent job. Just rub it in thoroughly, until the stock looks like it is covered in mud, then wipe cross-grain after the filler is dry. G-96 oil finish was used to finish the wood. This is applied exactly like Tru-Oil.

The lock plate, hammer, trigger assembly and sights will not require any metal polishing or finish. Strip the barrel of all components. Draw-file and polish the barrel and the tang with aluminum oxide. Remove the grip cap and touch up the polish. The steel screws, both wood and metal, must also be polished. Since this is a target pistol and a bright, high polish will interfere in shooting, the polish was purposely left a soft satin. All steel parts were blued.

When the stock finish is completed, the steel parts blued and brass polished, reassemble the gun. Remember that the inletted recess may have some finish build-up, so clean these carefully, especially around the edges and bottom. Pull all screws up tight, aligning the screw slots parallel to the length of the barrel, if possible.

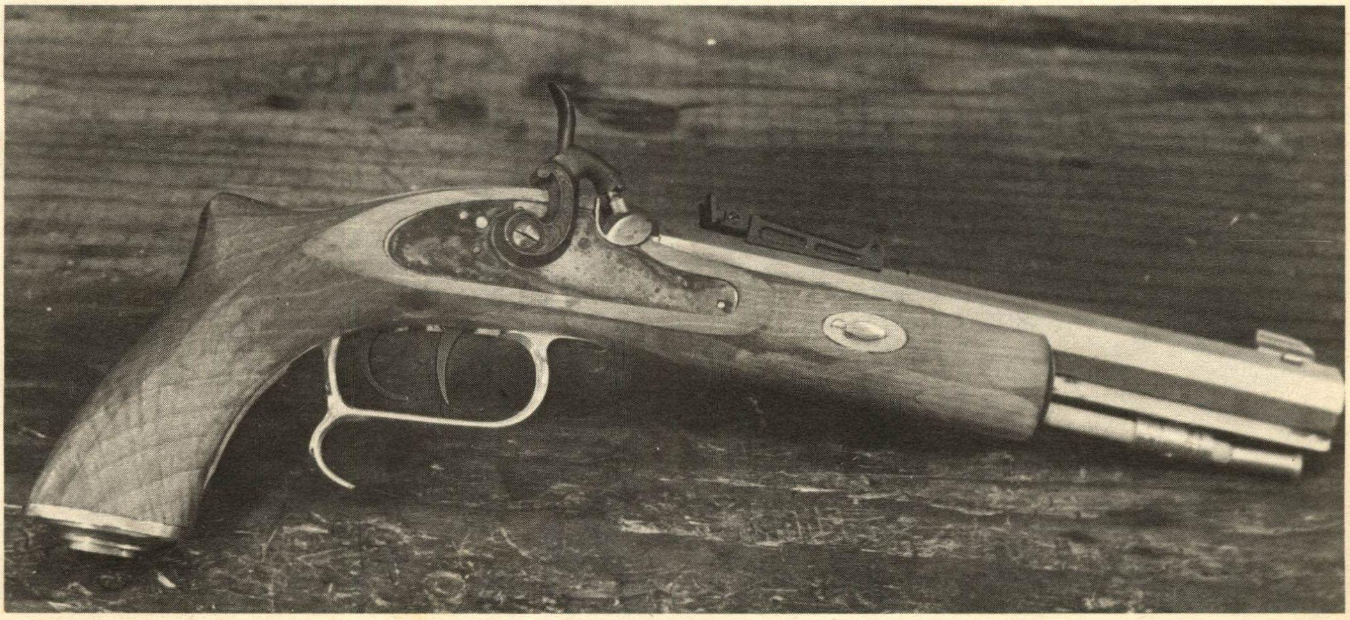
Many muzzleloaders tend to forget one important factor! Each time they load the gun it is the equivalent of handloading a modern cartridge. Maximum accuracy is achieved only after working up a load a few grains of powder at a time. Bullet, patch, patch lubricant and seating pressure also must be consistent and uniform.

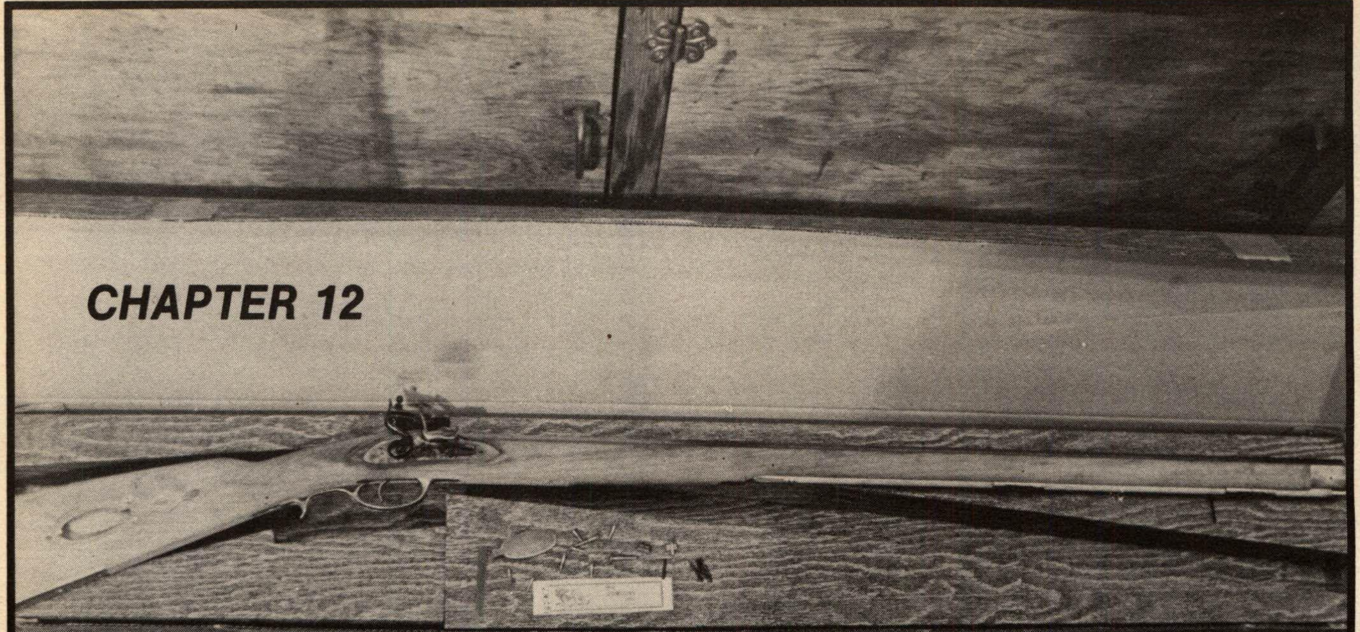
The Markwell Loyalist Pistol Kit can be made into an excellent target muzzleloader with patience and care in construction. However, all of this is lost, as far as accuracy is concerned, without correct and uniform loading. Take your time and you will be surprised at the results!



*Brass ramrod tip is placed on ramrod, tightened in padded vise and pilot hole for pin is drilled.*

*Completely assembled Markwell Loyalist Pistol is ready for test firing and final finishing.*





CHAPTER 12

# ARMOURY KENTUCKY FLINTLOCK RIFLE

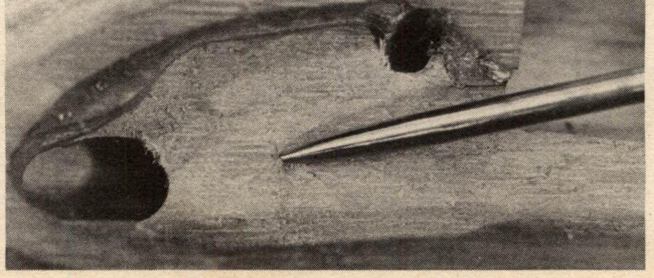
## Assembling This Full-Stock, .45 Caliber Kit Leads To A Healthy Respect For Early Gunsmiths

TO AMERICANS, no other rifle has ever matched the emotional appeal of the Kentucky rifle. It has, in fact, become a national emblem. "America, the nation of riflemen" is a well-known slogan, with its beginning attributed to this rifle.

In their haste to lay wreaths of glory on the rifle, many historians have gone far astray of the truth: It was the first rifled barrel; the first to use a patched ball; no British redcoat dared show his head at five hundred yards. These are but a few examples. The rifle needs none of these, for it stands on its own well-earned truth in American history.

The actual date of the first rifled barrel is lost to history. Most historians are of the opinion that rifle makers borrowed the idea from the angled fletching on arrows that imparted a stabilizing spin and increased accuracy. Whatever the date, one fact remains undisputed: Maximilian I was king of Germany from 1486 to 1519 and the Holy Roman Emperor from 1493 to 1519. A matchlock, bronze-barrel rifle with multiple grooved slow-twist rifling exists carrying his crest while he was king of Germany!

As to the use of a patch around the ball, Alonzo Martinez de Espinar of Spain fully describes the common



*Lock recess is reasonably clean but requires some cleaning and scraping to level high spot, as shown.*

use of patches and their effect in his 1644 *Treatise on Guns and Shooting!*

The rifle in Europe was primarily developed in and around Germany, hence the word jager. Depending on the use of the word, it means marksman or hunter and the rifle with true rifling was commonly called a Jager rifle.

When the immigrants from central Europe began to settle in Pennsylvania in the early 1700s, they brought their Jager rifles and their gunsmiths. Most of the rifles were around .65 caliber or larger, with thirty to thirty-two-inch barrels. Most were loaded by pounding an oversized ball down the bore to fill the grooves, but some used patched balls. The rifles did not lack in accuracy, but were slow to load and featured several other characteristics that played an important role in the transition to the American version.

The jager in Europe hunted for sport, such trips seldom lasting for more than a few days. With everything packed and traveling on foot, the American frontiersman was often gone for months. One pound of lead will yield sixteen round .65 caliber balls. In .50 caliber, the same pound of lead produces thirty-seven round balls. That is twenty-one more shots from the same pound of lead packed over hill and dale!

Add to this that the smaller .50 required about fifteen to twenty grains less powder for the same velocity. If the heavier .65 caliber powder charge was used, velocity increased around three hundred feet per second with a much flatter trajectory, which meant fewer misses even if range estimates were not correct.

In order to avoid the heavier charge of powder, barrel length was increased to around thirty-six and up to forty-three inches. The one technical mistake was the assumption that if ten inches more barrel length increased velocity with the light load, then an even longer barrel was equally better. Based on this assumption, barrels sixty inches in length were not uncommon.

With these much longer barrels, weight became a problem. The end result was the long, slender stock. It was the right type of rifle for the everyday requirement in a specific geographic area. While originating in Pennsylvania, it was used primarily in the unsettled west, loosely called Kentucky. The true American version reached its peak around 1750, and held its own for the next eighty-odd years.

Accuracy? This depended on the quality of the rifle plus the skill of the shooter. Most shots were at fifty to one hundred yards with an occasional one at 150 yards. At two hundred yards a man-size target was possible, but not the pin-point accuracy claimed – much less the five hundred yards' story!

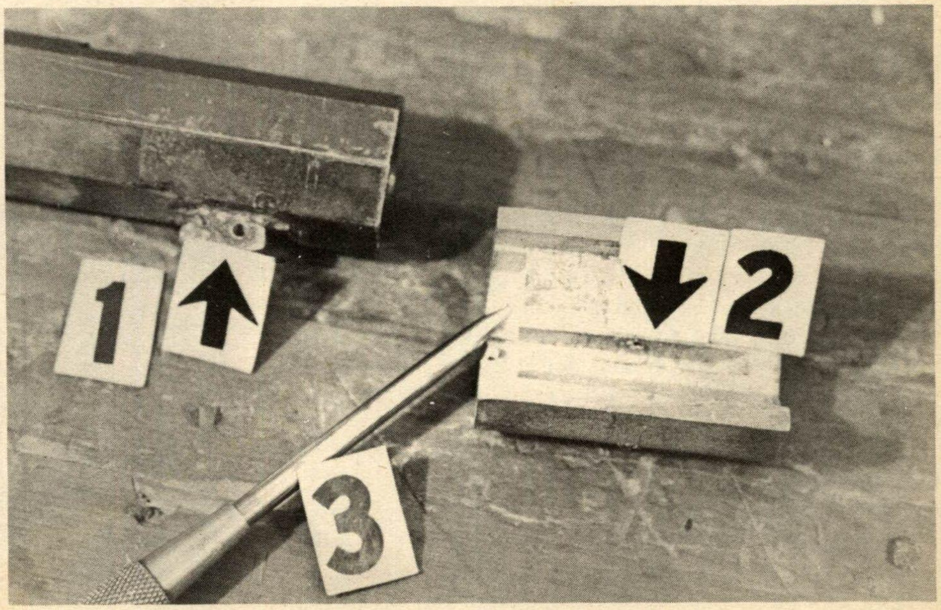
Around 1820-1830 the barrel length dropped back to thirty-six to forty inches. The elaborate patch boxes became simpler and the decorative metal inserts declined. Calibers dropped down to about .40 minimum, with .45 and .50 as the most common.

The Armoury Kentucky rifle kit is basically of this period. The barrel is thirty-six inches long, 13/16 inches across the flats and rifled with eight narrow lands. Although designated .45 caliber, actual bore diameter is .451 inches. Fitted with a full-length, one-piece, light-colored walnut stock, the fifty-inch overall length rifle weighs only seven pounds. Even without removal of excess wood and final finishing, the balance is remarkable.

Many companies claim ninety percent inletting and fitting, and the Armoury delivers a full ninety percent, if not more. Their instructions state that the kit has been designed for assembly without special tools or skills. Anyone who has ever assembled a one piece full-stock flintlock Kentucky rifle from scratch would agree one hundred percent with this statement. A full-stock Kentucky using the old system of cross pinning wood and metal, the matching of long octagonal barrel and channel, plus ramrod channel and a dozen other items is not the easiest muzzleloading rifle to assemble.

The Armoury has taken all of this really hard work out of this kit. The builder is left with just enough work remaining to make the kit interesting. By studying the construction, he will learn what is required to build such a rifle. With care and patience, the end product will have many of the graceful features that made the Kentucky rifle famous.

When you open the box, the rifle appears fully




*Arrow at No. 1 indicates solid tenon silver-soldered to bottom of barrel, pre-drilled for cross pin. Arrow No. 2 shows matching cross pin hole in brass nose cap, while pointer at 3 is the lip recess which receives wood forend of rifle.*

assembled with just a small plastic bag containing brass screws, pins, patch box lid with spring, plus the front and rear sights. Looks are deceiving, for a lot of work remains to be done. Actually, the rifle is just temporarily held together and partially finished on the hard jobs. Remove it carefully from the box and check the parts bag against the list in the instructions.

The first step is the same for all kits, read the instructions thoroughly! Also study the exploded diagram of the rifle so that you know exactly where every part and component goes in the complete rifle. If available, study an original Kentucky rifle or photos. You will notice many small features that can be built into or modifications made on the kit that will make your finished product a one-of-a-kind rifle. Few of the originals were exact duplicates, and the Armoury kit provides a lot of latitude for incorporating your own ideas.

Place the hammer in the half-cock safety notch. Loosen the two side-plate screws about half way and then tap them lightly with the back of a screwdriver or plastic-tipped hammer. This will move the lock plate out of its inletted recess as it is seated tight. Finish removing the side-plate screws, lock and brass side plate. It is a good idea to slip the screws back through the side plate and into the lock. This prevents parts loss while you are working on the rest of the gun. Nothing is more irritating than a lost part. An empty cigar box with a lid makes a good temporary cabinet when working on any gun.

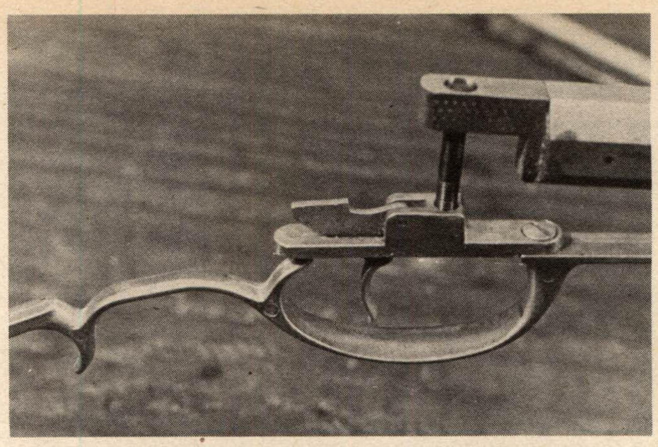
Now remove the ramrod. On this kit the ramrod thimbles were held in place by short, temporary pins, but most are just pressed into place without pins. A small-diameter pin punch should be used to check each of the pre-drilled cross-pin holes for short temporary pins.

The brass nose cap is held to the barrel by a cross pin passing through it and through a tenon which is silver soldered to the barrel. In addition, a recess in the rear of the nose cap fits back over the stock forend tip, securing it to the barrel and the nose cap. The cross-pin hole is pre-drilled in the nose cap and barrel tenon. Check your pin punch for a hidden short pin. There was none in this kit. Pull the nose cap straight forward off the barrel and forend. There is another barrel tenon about half-way down the length of the barrel. This cross-pin hole is pre-drilled through the stock and tennon. Also check this with your pin punch for a temporary pin. There was none in this kit.

The only thing now holding the barrel to the stock is the breech-plug tang screw. This passes down through the stock and into a threaded hole in the trigger assembly. The rear of the trigger guard is held to the stock by a cross pin. This is pre-drilled, so check with your pin punch for a temporary pin. Loosen the tang screw and tap its top with the back of a screwdriver or plastic-tipped hammer to loosen the trigger assembly from its inletted recess. Finish removing the tang screw and lift the barrel up and out of the stock. Now pull down on the trigger guard to remove this assembly from the stock.

All of the components are now off the stock except the butt plate, toe plate, and patch box cover. These are held in place by small, temporary steel screws. Leave these components attached until later. On final fitting, the temporary steel screws will be replaced by brass screws.

Although the lock recess is fully inletted and has a good snug fit, a close examination will reveal that most of the work is machine inletting. This always leaves tiny slivers of wood and rough surfaces at the bottom of the recess. The gun may work perfectly at first, or even after a hundred or more shots, but sometimes one of these slivers of wood will work loose and jam the lock. Use a flat-end scraper to clean and smooth the bottom of the lock recess, thus eliminating this potential problem. Take care not to remove any wood from the sides or the lock support edges. A clean, smooth lock recess not only is the sign of quality craftsmanship, but also a very practical step in correct construction.

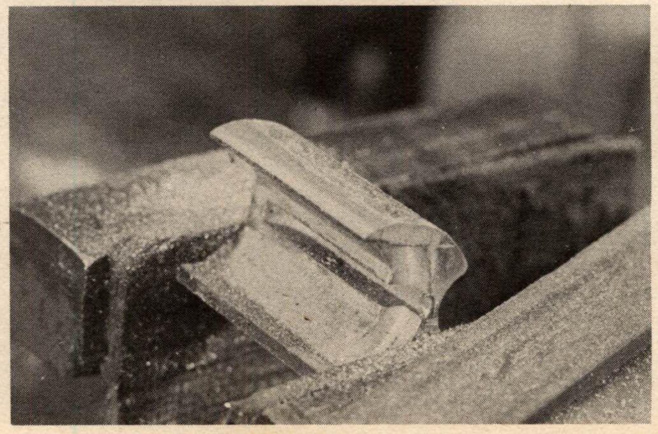


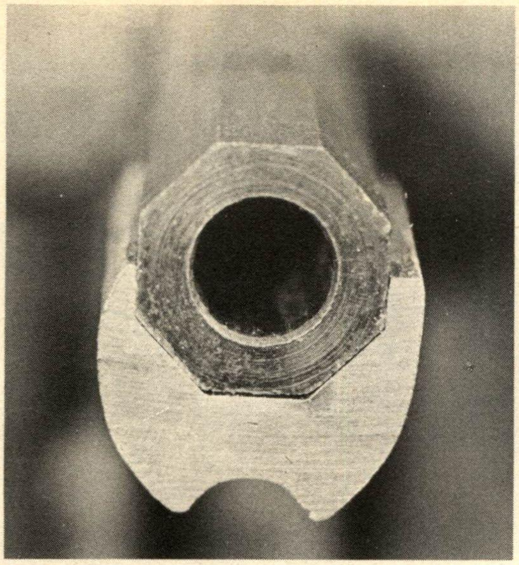
*Without wood stock, this view provides picture of relative position of trigger group and barrel. Tang screw passes through barrel tang into trigger.*

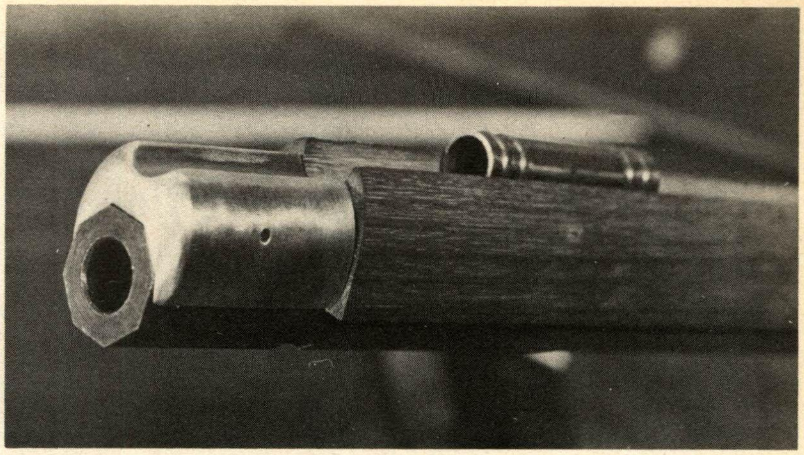
The brass side plate was fully inletted and seated. This also was removed and the bottom of the inletting smoothed to remove a few rough spots. This may seem to be just extra work with no practical advantage and this is true, but it is a matter of personal pride. Attention to such small details as this will be reflected in the important details. It builds attitude. A person ignoring small details will automatically have a sloppy, just-get-by attitude throughout all of his work.

The trigger assembly is pre-inletted and held in place by the tang screw when received. The assembly consists of the trigger guard, trigger plate, a screw that joins the trigger plate to the trigger guard, the trigger, and a cross pin to hold the trigger in position in the slotted trigger plate.

*Brass nose cap must be held in padded vise jaws as it is shaped with draw file across top edge.*







*Partially finished nose cap at left will soon appear as it does above. Note that long forend will have to be recontoured to match brass nose cap. Text describes method of contouring top edge of nose cap for best results.*

When first received, there was a small amount of backward and forward loose movement of the trigger, indicating an improper fit of the top of the trigger blade with the lock sear bar. Tightening the tang screw decreased the loose movement, but did not fully eliminate it. When the trigger assembly was removed from the stock, the cause was obvious. The wood seating recess in the inletting was rough. This was eliminated with light strokes of a scraper in smoothing the wood surfaces.

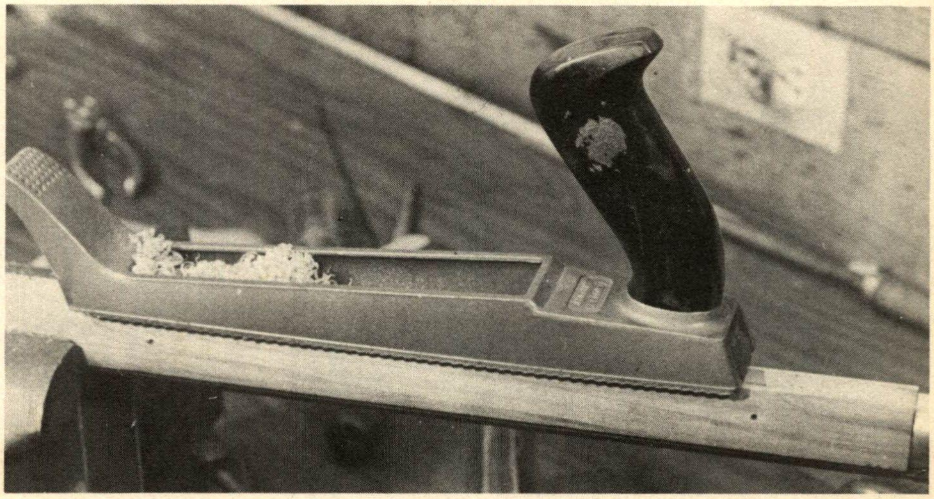
In addition, the brass-cast trigger guard and trigger plate still had molding marks, which prevented flat seating against the wood support. Using a single-cut file, the molding marks were removed and all surfaces were filed flat and polished. When reinstalled, the trigger assembly was pulled up tight and the problem eliminated. Care must be taken in doing this as it is possible for the trigger blade top to partially compress the sear bar, which in turn would mean only partial engagement of the sear with the hammer tumbler sear notch. To check this, tighten the tang screw slowly while working the trigger back and forth. You can feel the two parts engage.

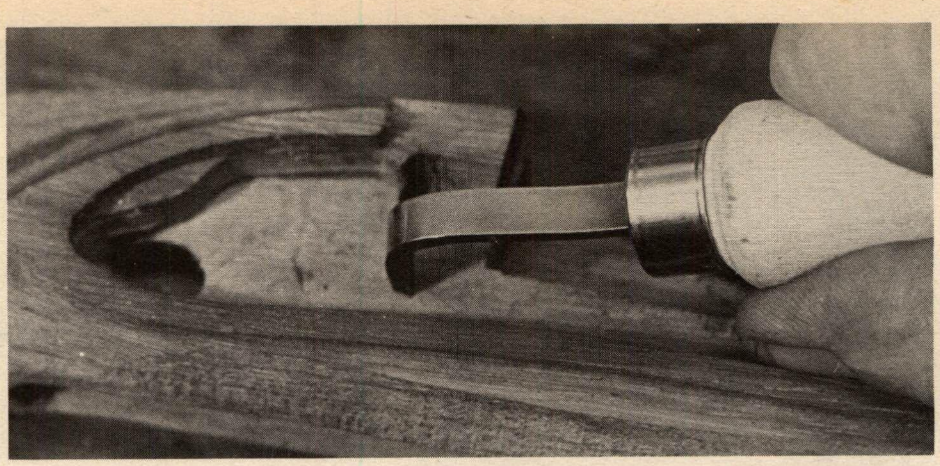
Now check the hammer and trigger by putting the hammer on half cock and full cock. You can feel the full engagement. In addition, you can also feel the amount of engagement by slowly pulling the trigger until the sear disengages from the full-cock notch. A trigger pull gauge can also be used. If you have too much engagement, file a small amount of metal from the bottom of the trigger blade where it contacts the trigger plate. This will allow the top of the blade to come down for less engagement with the sear bar. Go slowly and remove only a small amount of metal, then retest. It is a matter of repeated cut and trial.

While the top of the trigger blade was in correct contact and the back-and-forth play eliminated, the trigger had considerable side-to-side loose play. The slot in the trigger plate was too wide for the trigger blade, allowing side-to-side movement of the trigger on the trigger cross pin. The pin was removed to disassemble the trigger from the trigger plate. The sides of the trigger were polished, as were the sides of the slot in the trigger plate. Next, two small washers were thinned and one held on each side of the trigger as it was reinstalled in the trigger plate slot. The trigger pin was inserted and all side play of the trigger was eliminated. If small washers are not available, you can make them from thin sheet metal by drilling a hole slightly larger than the trigger pin. In either case, the washers should work freely and not bind the trigger.

The barrel channel required only light use of a scraper to

*Stanley Surform plane is used to rough shape stock forend. Care must be exercised so as not to hit brass cap with plane.*





*Small square end scraper is used here to remove a bit of extra wood ensuring better barrel fit.*

achieve snug seating full length. The final check is to be sure the lock is snug against the side of the barrel with no gap. As previously stated, this is important; a gap at this point can allow powder from the pan to trickle down into the lock recess. In this kit the fit was perfect and the touch hole centered in the pan recess. If a gap had existed, it would have been necessary to inlet the lock deeper to eliminate the gap.

With the lock mechanism, trigger assembly and barrel correctly aligned and functioning correctly, we can now concentrate on shaping the stock and other components. With a single piece full-length stock, this is an important job if the end result is to have the long, graceful lines of a Pennsylvania/Kentucky-style rifle. If not done correctly, the final product will have a stubby, thick appearance.

The brass nose cap is the place to start. When received it was necessary to use a plastic-tipped hammer to tap it forward and off the barrel as it is a tight fit. The insides should be cleaned carefully with a file, removing only the rough spots. Go slow! It is important that the close fit be maintained, just enough brass is removed so that strong hand pressure will remove the cap. Remember that you still have to polish the barrel, which will make the cap easier to remove, but without a sloppy fit between cap and barrel.

Note that the top edges of the nose cap are about 3/8 inches wide. Place the nose cap in a vise, the two ends held by the vise jaws and as much of the cap protruding over the jaws as possible. Use a six-inch single-cut file held at a forty-five-degree angle to the flat top of the nose cap side. Draw file at this angle until the top flat of the nose cap side width has been reduced to 1/8 inch. Now use the file on the sides, filing straight back and forth to blend in the round bottom shape of the nose cap with the top 1/8 inch width. The draw filing keeps the edge parallel and the same width, the straight filing blends the rounded bottom until the cap looks the same, except that the top edge is now only 1/8 inch wide. Repeat on the other side of the nose cap.

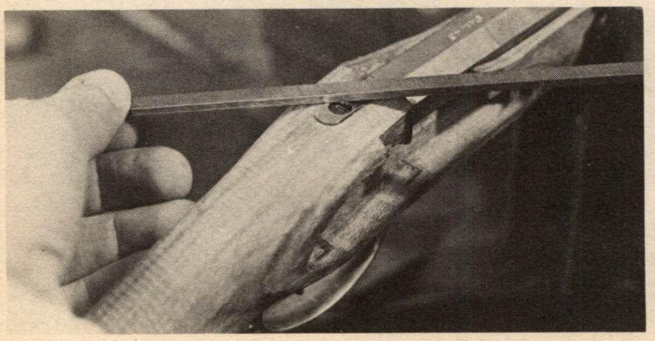
Slip the cap back on the barrel and use a small punch to line up the hole through the nose cap with the pre-drilled hole in the barrel tenon that secured the cap to the barrel. Closely examine the end of the nose cap and the end of the barrel. On this kit they were exactly flush. If not, draw file the brass cap back until it is flush with the barrel muzzle. Now measure 1/16 inch on each side of the brass from the muzzle end and scribe a line. Remove the nose cap, insert in a vise and draw-file down to the scribe line. Reinstall on the barrel and check your work.

Next file the outside on the muzzle of the nose cap, rounding the edge. You do not try to make the rounding a half circle, only a smooth, graceful rounding of the edge. Wrap aluminum oxide cloth around a file and smooth the nose cap, removing all filing marks and roughness in the bottom section of the original shape. Don't forget to smooth the ramrod recess.

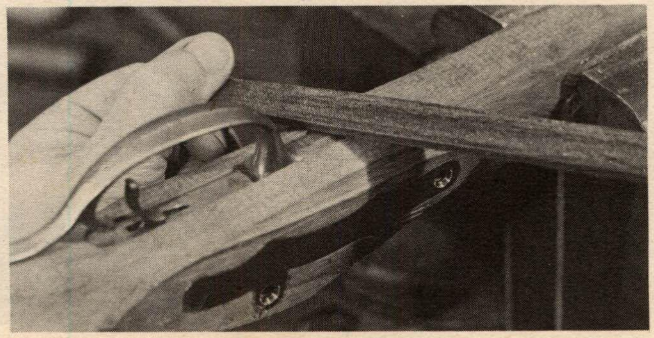
If you examine an original rifle, you will see the importance of shaping the brass nose cap. The originals are rounded on the bottom, with only a small edge where the cap meets the sides of the barrel. The barrel muzzle usually extends about 1/16 to 1/4 inch past the front of the rounded nose cap end.

Reinstall the barrel in the stock and slip the nose cap into position, using a pin punch to line up the nose cap hole

*Narrow pillow file is ideal tool to shape and contour steel tang to match contour of stock.*



*Single-cut metal file is used to shape front of trigger guard and wood stock at same time.*



and barrel tenon hole. By looking at the front where the nose cap joins the stock forend, you will see a considerable amount of wood extending past the sides of the nose cap. Use a pencil to mark the wood around the nose cap where they join. Make a heavy line, as this will be used to shape the stock to match the nose cap. Remember that you cut down to the pencil line. The heavy line will prevent removing too much wood. The sanding operation will do the final blending of wood and nose cap.

Remove the barrel and nose cap. Remove the front and middle brass ramrod thimbles. With a sharp pencil, mark the sides of the wood around the rear thimble and its extension. Remove the rear thimble. Incidentally, it is a good idea to use a metal scribe to mark the flat sections of the thimbles that fit up into the stock. Mark one M for middle, the other F for front, and mark a small arrow on each pointing toward the muzzle. These scribe marks will help you reposition the thimbles with the pre-drilled cross-pin holes.

Install the stock securely in a padded vise, belly up, taking care not to crush the forend. Use a Surform plane directly over the ramrod channel and slowly plane the stock down level with your mark at the forend. Be sure to keep both sides of the ramrod channel equal. This can be done with the four-in-hand rasp or a large metal file; the Surform plane just does it quicker. Go slowly when you reach the rear thimble recess. As the thimbles are formed from sheet brass, the rear thimble extension is thin and this area is best completed by using a metal file to remove the excess wood down to the pencil mark.

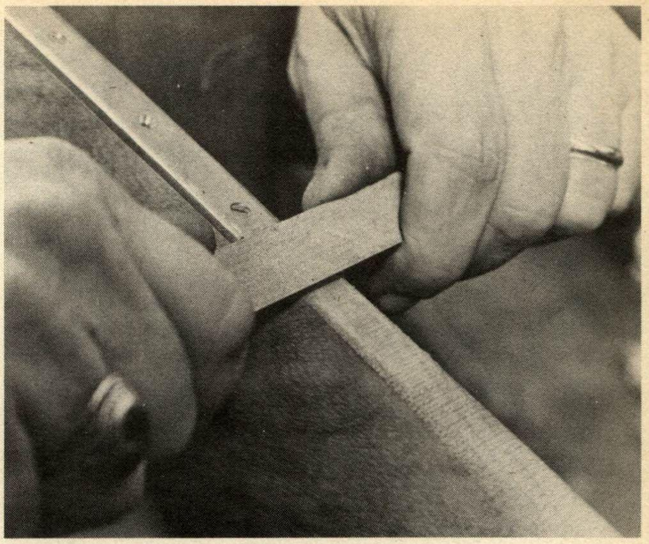
Loosen the vise, turn the stock right-side up and secure the stock in the vise. Angle the Surform plane to about a forty-five-degree angle to the flat top edge of the stock. Slowly and carefully plane this edge down until it is about 1/16 inch wide, the same way you did the forend brass nose cap. Repeat on the other side.

Next, with the Surform plane, slowly and carefully reduce the excess wood on each side of the forend. Maintain the same rounding shape, only making it smaller. Light strokes are the key. Switch to a larger metal file and blend the lines in a graceful curve, removing any flat sections created by the plane on the sides of the forend. Remember to only come down to the pencil mark in this initial shaping. The sanding operation will do the finish work. The forend should now be relatively close to the rear thimble. These establishing stock lines will help you with the remaining sections of the stock.

Reinstall the barrel and trigger assembly and secure the stock in the vise. With a pin punch, line up the pre-drilled rear hole that secures the rear of the trigger guard to the stock. With a metal file, file across the stock and front end of the trigger guard until the wood and metal blend. Use the same procedure on the rear trigger guard end and wood.

From the brass toe plate up to the rear of the trigger guard, the stock has a flat surface. Use a four-in-hand rasp, smooth flat-end or metal file to remove the excess wood. Leave a small amount of wood for final sanding.

You will have excess wood from where you shaped the front of the trigger guard up to where you shaped the section for the rear thimble. Reinstall the rear thimble. With the four-in-hand rasp and metal files, decrease the excess wood. Blend these two sections together level and maintain the original rounded stock shape. This will have established the bottom lines of the stock.



*Bottom line of stock is established as flat wood section is shaped to carry line from toe plate to rear of the preshaped trigger guard. Single cut metal file is used.*

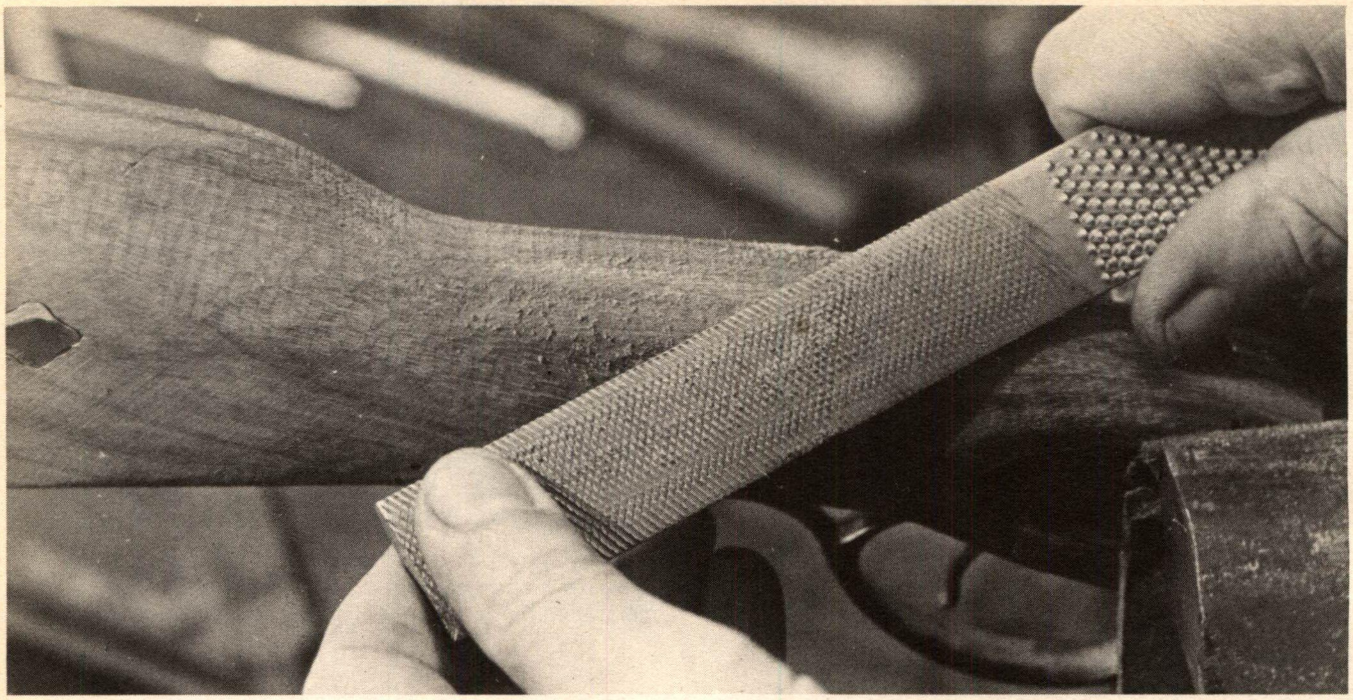
Turn the gun over so that the top side is up, and secure in the padded vise. With a metal file, shape the barrel plug tang down until it matches the contour of the stock. Be sure the tang screw is pulled up tight. In filing the tang, contour it not only on the top but also on the sides until it blends with the contour of the stock at this point.

Now blend the narrowed barrel channel edges with the wood shields around the lock and lock plate. This should be a graceful flaring-out from the narrow sides to the more thicker wood shields.

The lock on this specific kit was almost flush with the surrounding wood shield surface. No shaping of the wood surface was necessary, as the small amount of excess wood was removed in the sanding stage to match lock and wood surfaces. The lock plate was seated deeper, but not enough to make the usual pencil marking around its edges. Instead, a metal file was used, brass plate removed, and by draw-filing the wood only two checks with the brass plate inserted were required. A small amount of wood was left for the final sanding stage.

The patch box is the next job and this is pre-inletted and held in place by two temporary, small steel screws. The patch box cover, spring and connecting cross pin are not assembled to the patch box. This was one place where the pre-inletting was a poor fit, but this can be corrected in several ways and will be explained later. Right now the job is to assemble the cover and spring. The patch box has a sheet-steel bracket shaped like the capital letter U, except square and attached by brazing at the bottom of the U. The patch box cover has a similar, but smaller piece of steel with the letter U resting on its side and brazed in place. The smaller attachment on the cover slides into the larger attachment on the patch box and a cross pin connects the two, allowing the cover to move up and down.

The holes for the cross pin are pre-drilled in both attachments; however, they required cleaning with needle files to remove burrs from the drilling. The cross pin was



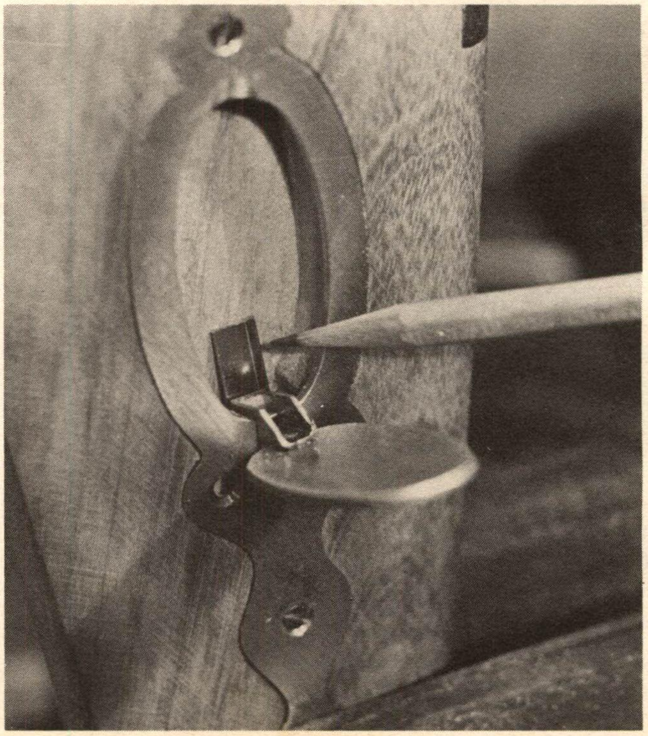
*Four-in-hand wood rasp reduces size of stock wood pistol grip while maintaining established contour.*

then installed. The cover has a beveled edge that is supposed to mate with the patch box whose edges are straight. In this instance, it was necessary to use the needle files to lightly bevel the square edges of the patch box before the cover would seat evenly. Work slowly, for if too much metal is removed the patch box cover will seat too deeply.

The spring is a flat piece of spring steel with a hole in one end. A recess for the spring is already cut in the patch box recess to match the width and length of the spring. The front patch box screw passes through the spring and holds it in place. Two problems were encountered in this specific kit. First, the patch box would not fully seat with the spring in place; obviously due to the spring recess not being deep enough. The scraper was used to deepen the recess, checking several times to be sure the spring was held in place firmly but not sloppily. The moment the patch box surface is level with the stock surface, the spring recess is deep enough. The second problem was that the spring was too long and its end was hitting the bottom of the patch box recess with the lid open. This was corrected by cutting off a small amount of the spring end using the Dremel Moto-Tool with a cutting disc. It is best to make several small cuts to avoid shortening the spring too much. When reinstalled, the cover and spring worked perfectly.

Now, to go to the problem of correcting the excess inletting that created a small gap between the front edges of the brass lock plate and the wood walls of the inletting. The rear of the patch box was a good fit. A gap in inletting is not unusual even when done by hand. There are two basic ways to correct the problem.

The first is with the use of Acraglass, marketed by Brownells. A complete, detailed set of instructions comes with each kit and should be thoroughly read and followed. The two basic components are a resin and a hardner. To add strength, glass floc is added to the two mixed components. A fourth ingredient is a powdered light-brown stain. Its most common use is in glass-bedding barrel



*Patch box spring is too long, as indicated at pencil point. Text describes method of shortening spring by fit and try until flawless functioning results.*

channels and action recoil recess, but it can be used in literally thousands of ways in gun work. The more you use it, the more various applications you will find for it in all gunsmithing. So, you can glass bed the patch box using the brown powder to match the wood color. One word of caution, read and follow the instructions without deviation.

The second method is with the use of epoxy glue. First, polish the end of the patch box until it is smooth. Now place a little Johnson's floor wax in a small can and heat it until it melts. Use a small paint brush or cotton swab to thoroughly coat the patch box. Do not miss a spot. The thin wax coat prevents the epoxy from bonding to the metal. Next work a little epoxy down into the gap until it is full. Then sand the stock around the patch box, allowing the wood dust to mix with the epoxy. If you wish, you can collect some sanded wood dust first and just mix it with the epoxy before applying the epoxy. Allow it to dry. The gap will no longer be visible as the wood dust blends with the stock.

If you plan to stain the stock, do this first, then mix the stained wood dust with the epoxy. Once the epoxy is dry you cannot stain it, so make this decision before filling the gap. The only difference between using Acraglass and the epoxy is the curing time factor. Epoxy cures, or dries, slower and is the best method unless you are thoroughly familiar with Acraglass. However, this is for cosmetic appearance. If the gap is around the lock or barrel, you want strength and Acraglass is the best choice.

While on the subject, suppose you have a wood screw that is loose and will not tighten. Drill the hole larger than the diameter of the screw. Coat the screw with Acraglass release agent. Now fill the screw hole with Acraglass. Push the screw down into the Acraglass and put a C-clamp on its head to press it down hard. Allow the Acraglass to harden. The screw can now be removed and reinstalled as the Acraglass has formed a perfect tough seat or nut for the screw!

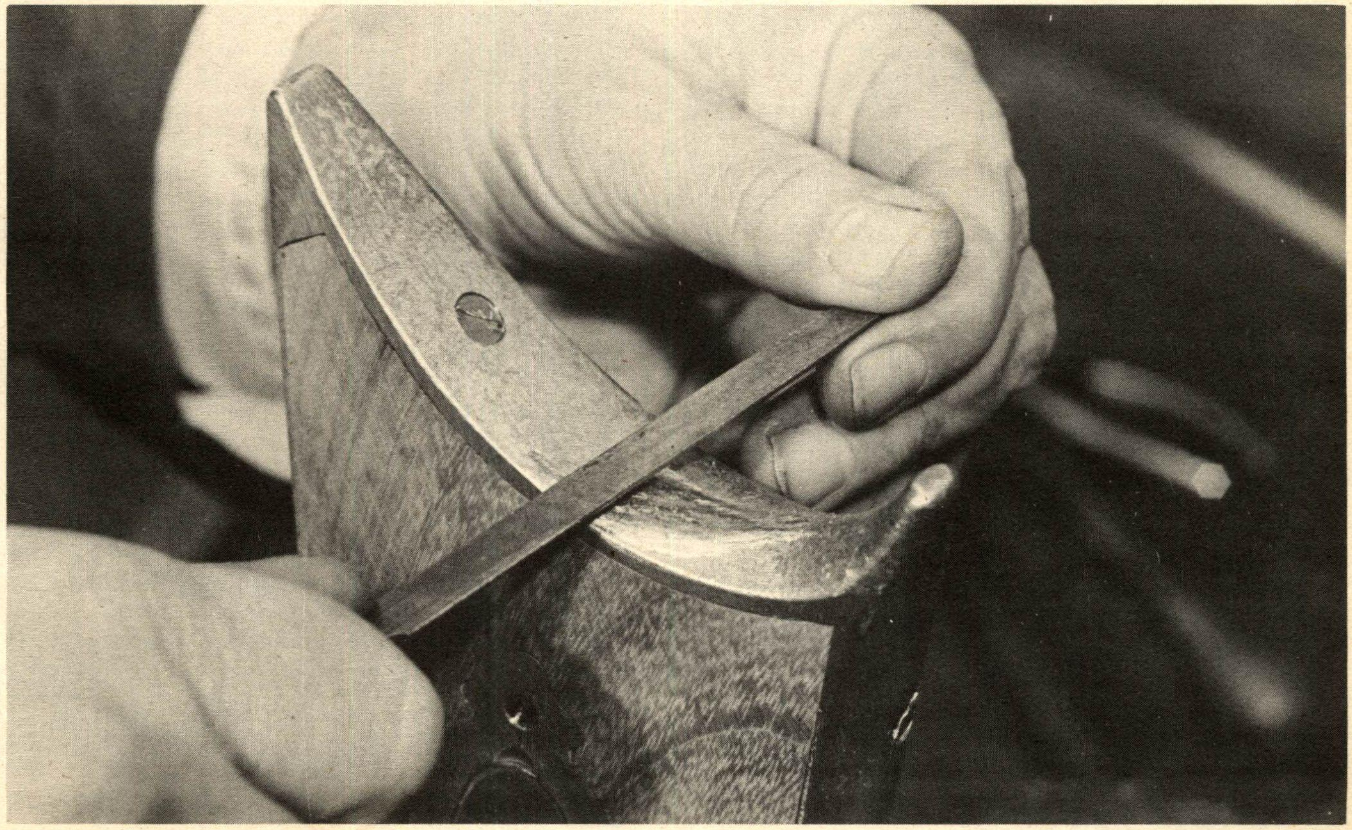
To finish the patch box, drill the remaining holes with a small drill to serve as a pilot for the brass screws. As the patch box will be sanded and polished in the final finish, be sure each screw pulls up tight. The two temporary steel screws are replaced with the permanent brass wood screws.

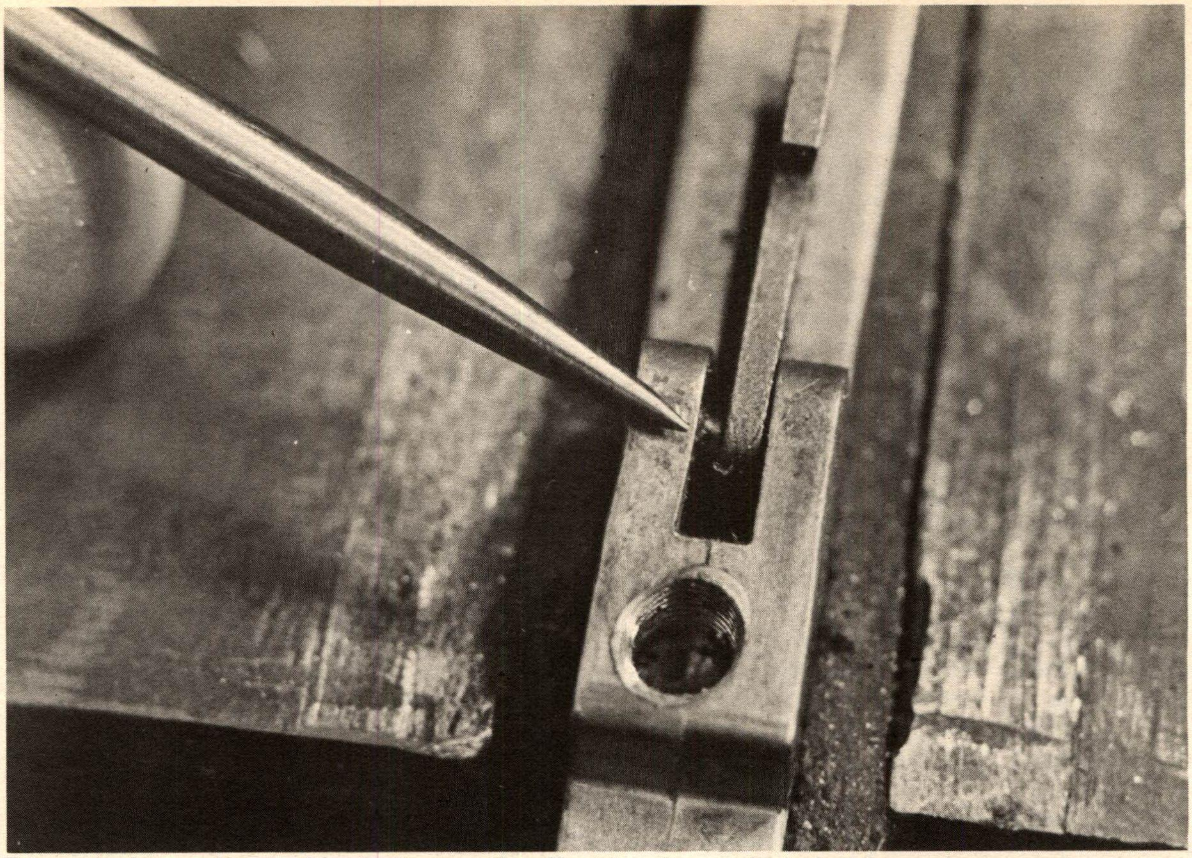
The brass butt plate and brass toe plate are held to the stock with small, temporary steel screws. These will be replaced by permanent wood screws. Check all around the butt plate and toe plate for gaps in the fit. With this specific kit, the fit was perfect, but if not, then use inletting black on the brass and move the butt plate forward for a correct fit. The same would apply to the toe plate.

Use files and aluminum oxide cloth to remove the roughness in the brass castings and to polish them. Remove the two temporary steel screws in the butt plate and replace them with the permanent brass screws. The toe plate has two temporary steel wood screws which are also replaced with permanent brass screws. The center hole in the toe plate will have to be drilled with a pilot drill and then the brass screw installed. Polish the screw heads, blending them with the surrounding brass surface.

The front and rear sights are installed next. The rear sight is a steel casting and will require the Dremel Moto-Tool and polishing point to smooth it up and eliminate the rough spots. I personally prefer not to bring it to a high polish, as

*Brass butt plate is carefully shaped and smoothed with files and aluminum oxide cloth. Note lack of gaps.*





*Trigger slot is too wide, resulting in sloppy action. Text describes method of adding washers on each side of trigger until trigger is centered and all side-to-side slop is eliminated. Photo is top view of trigger assembly.*

a dull rear sight does not reflect light. The bottom should be smoothed and the male dovetail lightly angled on one end. The female dovetail in the barrel will have to be widened. Remember to angle this also, as the sight is inserted from right to left with the muzzle pointed away from you. Use a sight file to widen the dovetail, not deepen it, or you will only create an unnecessary problem. Tap the sight in for a snug, solid fit, exactly in the center of the barrel.

The brass front sight is finished and polished with the top of the blade angled inward like a pyramid. The barrel female dovetail will require widening the same as the rear sight. Tap the front sight in place, center of the barrel.

The reason for installing the sights at this stage is so the rear of the stock can be shaped. The sights are low on the barrel and the comb of the stock is cut down slowly until, when you place your cheek against it, the sights will be in line and the stock will be comfortable – otherwise, you will have to press your cheek in hard to see the sights. The original rifles had an excess amount of drop at both heel and toe of the stock. Therefore, lowering the comb of the stock slightly will not decrease the overall appearance. Use the Surform plane, but try to keep the side contours of the stock even and following the original lines.

The wrist, or pistol grip, of the stock is too thick. As the bottom cannot be altered due to the trigger guard, remove the excess wood from the top. Use the four-in-hand rasp to shape this section. The idea is to decrease the top-to-bottom width, but retain the original lines. This should be blended in with the front comb of the stock. The width of the stock, side to side, is about correct, so little if any wood is removed.

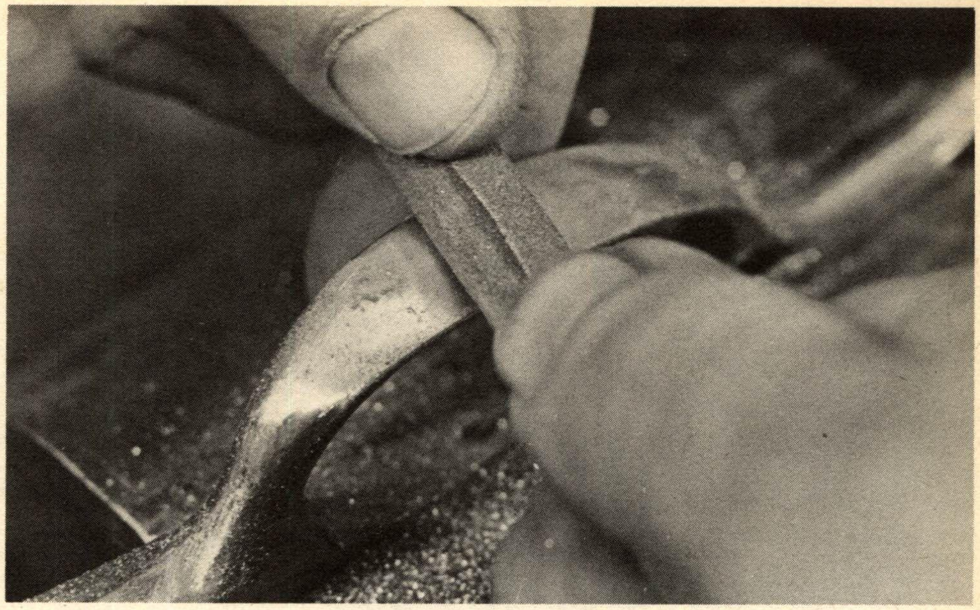
Now go over the stock with a metal file, removing any rasp or irregular marks. The stock is now ready for sanding. The sanding should blend all the lines of the stock and give the final remaining, wee bit of shaping.

Although barrel length and overall length are shorter than the extra-long Pennsylvania/Kentucky rifles, this rifle will have many of the graceful lines of the originals. By removing the excess wood down to a practical minimum and blending the lines of the stock, the finished gun will appear much longer than it did when you started. You can add brass inlays if desired, but they will distract from the long, graceful appearance and make the rifle appear shorter.

After the final sanding and whiskering, the light European walnut was very lightly stained with Brownell's water-base stain cut half strength and two parts brown to one part red to bring out a rich mellow color with just a tinge of red tint. The stock was then finished with Tru-Oil and compounded back for a soft velvet sheen.

The brass trigger guard, butt plate and all other brass was sanded with aluminum oxide cloth, then polished with felt bobs charged with 400-grit compound and use of the Dremel Moto-Tool. This removed all scratches and brought the brass to a high polish. Next four aught steel wool was used to burnish the brass. This very lightly dulled the high polish – which I feel is out of place on this gun – and left a nice velvet sheen to match the stock.

With sights removed, the barrel was draw-filed but required only a small amount to remove a few rough places.



*Aluminum oxide cloth wrapped around file is used to smooth cast trigger guard. External metal parts are thus polished.*

Next, aluminum oxide was wrapped around the file and the final polishing done on all barrel flats. This is about as far as the original barrels were polished, and those of the period up to around 1800 were browned. If this is your choice, Birchwood-Casey's plumb brown will closely duplicate the color; but apply several coats as the original barrels were dark brown.

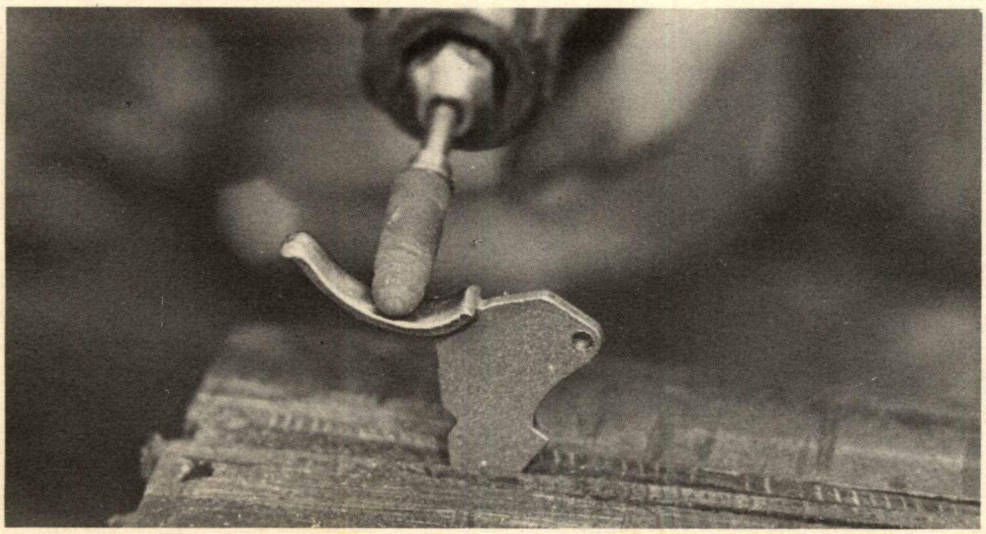
This rifle is of the 1800-1840 period in design. This is also the period when gunsmiths first started using blueing. The color was a light, soft blue in most cases. If you want this color, use a steel burnishing tool on the barrel flats. The Birchwood-Casey blueing kit can be used provided you follow their instructions and keep the color light. Commercial hot blueing can also be used to obtain this shade, but the metal must be hand burnished. Advise the shop of what you want and if the gunsmith really knows how to blue, he can duplicate the color. If it comes out too dark, Simichrone polish can be carefully used to lighten the color.

All that remains is to reassemble the rifle. Remember to clean out inletted recesses where stock finish may have built up in the corners. As the barrel, stock and nose cap are cross pinned, use a small-diameter piece of wire to line up the pre-drilled holes. This is where the scribe marks on the thimbles really pay off in alignment. Tap the permanent cross pins into place using a small-diameter pin punch. If after prolonged use the pins become loose, use short pieces of drill rod to replace them.

The ramrod can be striped, if desired, by flame or a stained string. On this rifle I chose to burnish the rod with steel wool and finish it with Tru-Oil and no stain.

With this particular rifle, a .440 ball and a Crisco-greased .001 patch worked perfectly. Individual barrels vary even from the same manufacturer, so the powder charge, patch thickness, etc., all will have a bearing on achieving top performance. Start with a light load and thin patch, and work up to the load that performs best in your rifle.

The Armoury's rifle kit can be made into a nice, light rifle with patience and attention to detail. When it is completed you will have a healthy respect for the gunsmiths who made the Pennsylvania/Kentucky rifles from scratch!



*Polishing point mounted on Dremel Moto-Tool is used to smooth up trigger in padded vise.*

CHAPTER 13

# NAVY ARMS' 1864 SPRINGFIELD

NO OTHER WAR in American history has had the emotional impact as the internal conflict that raged from December 20, 1860, until May 26, 1865. The first date was when South Carolina repealed its ratification of the Constitution and declared itself an independent nation; the latter date, the surrender of the last Confederate troops under the command of General Kirby in Texas.

The conflict lasted just a few weeks short of 4½ years. During this period a nation of 32,000,000 population suffered 359,528 Union and 134,000 Confederate deaths. Counting wounded on both sides the total was 714,245!

The conflict placed one section of the nation against another, state against state, and often brother against brother and father against son. Union forces numbered over 2,500,000 and Confederate forces 900,000 at its peak.

It divided and then reunited a nation. It also changed forever the firearms and tactics of war. The primary cause was the rifled musket. It was capable of three aimed shots per minute, firing a 500-grain lead bullet with 60.0 grains of black powder at 950 feet per second. From a machine rest, government records specify its accuracy as ten shots in a four-inch group at one hundred yards, nine inches at two hundred yards, and twenty-seven inches at five hundred yards. At 1000 yards, it had enough remaining energy to penetrate four inches of soft pine wood!

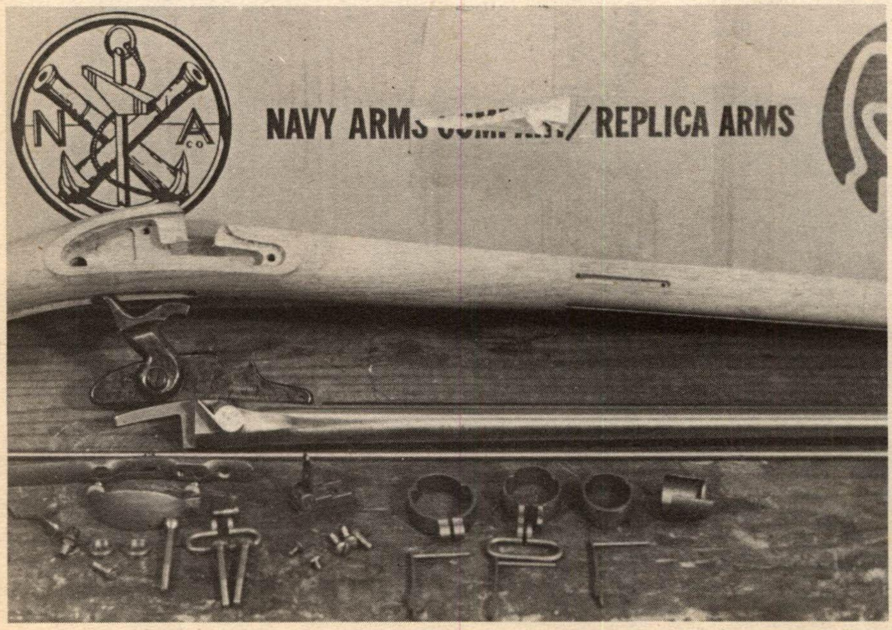
Rifles had been used in war before, but the large-scale use of rifles during the American Revolution, and its efficiency, created worldwide interest. The problem was how to retain the accuracy of a rifled barrel and the speed of reloading a smoothbore musket. Obviously, the patch around the rifle ball had to be eliminated.

In 1829, Captain Gustav Delvigne of the French army devised a method of partially flattening a ball by pounding on it in a small section at the bottom of the barrel just in front of the powder. The ball filled the rifle grooves but accuracy was lost. In 1849 another French army captain, Claude E. Minnie, came up with the answer in a cylindro-conoidal bullet with an iron cup in the hollow base that gas pressure pushed forward to expand the base, fill the rifled grooves and retain the desired accuracy.

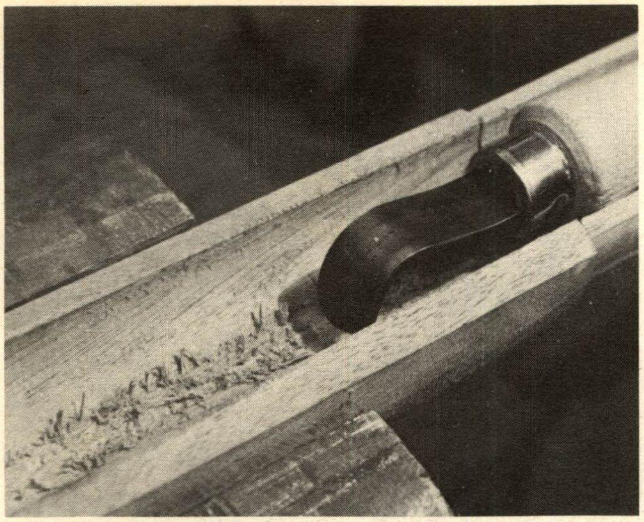
The only problem was that sometimes the iron cup pushed right through the bullet. James H. Burton of the U.S. Harpers Ferry Arsenal found that the iron cup could be eliminated with a properly designed base cavity that used the gas to expand the base. Burton finished the design but the name Minnie remained. The bullet and the rifle lasted only 15 years, but it changed military tactics that had existed for well over two hundred years.

Beginning in 1850, versions of the rifle and bullet were produced in England and the United States. Through trial and error the British finally settled on the .577 Enfield rifle-musket in 1853. Rifles of this pattern were destined to play an important role on both sides during the future war on the American shores.

The U.S. developed a somewhat similar rifle-musket in .58 caliber in 1855. The major difference was the use of the




**An Authentic Reproduction Of The Last Regulation Rifle-Musket In .58 Caliber**



*Fuzzy slivers of wood in barrel channel must be removed with large half-round scraper for optimum barrel seating.*

Maynard-tape primer device that used a roll of percussion pellets, somewhat like a child's cap pistol of today. Oddly enough, Jefferson Davis, then Secretary of War, played an important role in the development of the Model 1855 and granted approval for its adoption on July 5 of that year.

The Maynard-type primer proved unsatisfactory in the field and inferior to the tried-and-true method of installing individual percussion caps on the nipple. The end result was the adoption of the Model 1861. This, in essence, was a refined Model 1855.

Wartime pressure for simpler methods of manufacture culminated in the adoption of the Model 1863 in the early months of that year. The length of the cone seat was reduced and the cone-seat screw omitted. The lock was color case-hardened instead of the usual white, muzzle crowned instead of flat, hammer flattened on the side instead of being round. The main distinguishing feature was omission of the band springs. Instead, flat bands split at the bottom and tightened with a screw to hold them in place.

The open bands proved impractical, as they loosened and slipped forward during recoil. The recommendation to return to the band springs, plus other minor changes, were made in November of 1863. The recommendations were approved December 17, 1863, by Brigadier General George Ramsey, Chief of Ordnance, and submitted to the Secretary of War. Final approval was granted in the first week of January 1864. Although sometimes referred to as the Model 1863 Second Type, the correct designation is Model 1864, as model date was always determined in the year of approval by the Secretary of War. A total of 255,040 were produced by the Springfield Arsenal.

Navy Arms Company of Ridgefield, New Jersey, has been a major leader in the rebirth of muzzleloaders. Their products are true reproductions of the original guns and are of top quality. So close, in fact, that Navy Arms purposely makes changes that do not distract from the appearance or performance, but do prevent unscrupulous persons from passing their guns off as originals.

The Navy Arms Springfield Model 1864 Rifle-Musket has a precision rifled .58 caliber barrel forty inches in length. The overall length is fifty-six inches and the weight is 8½ pounds. The kit version is fully ninety percent completed with the barrel already polished to match the original. The lock is an excellent copy and comes in a beautiful, color case-hardened finish. The one-piece walnut stock is closely pre-inletted with just enough wood left for final close fitting of metal to wood. The external shape of the stock is equally close. The trigger group, bands and band springs are close-wax cast steel requiring final fitting and polishing.

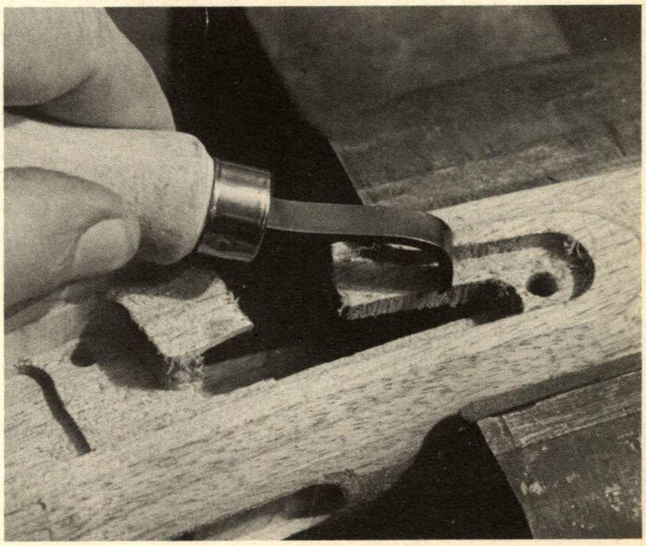
It is obvious that a lot of thought has gone into this kit. The difficult phases of constructing the rifle, such as the color case-hardened lock, would otherwise require extensive technical knowledge and expensive machinery. The kit eliminates these phases, yet retains the final hand fitting and finishing that requires time. Although I used some power tools in completing the kit, they are not necessary. All of the work can be done with only elbow grease and hand tools. In short, just enough work remains to make the kit interesting and a pleasure to complete.

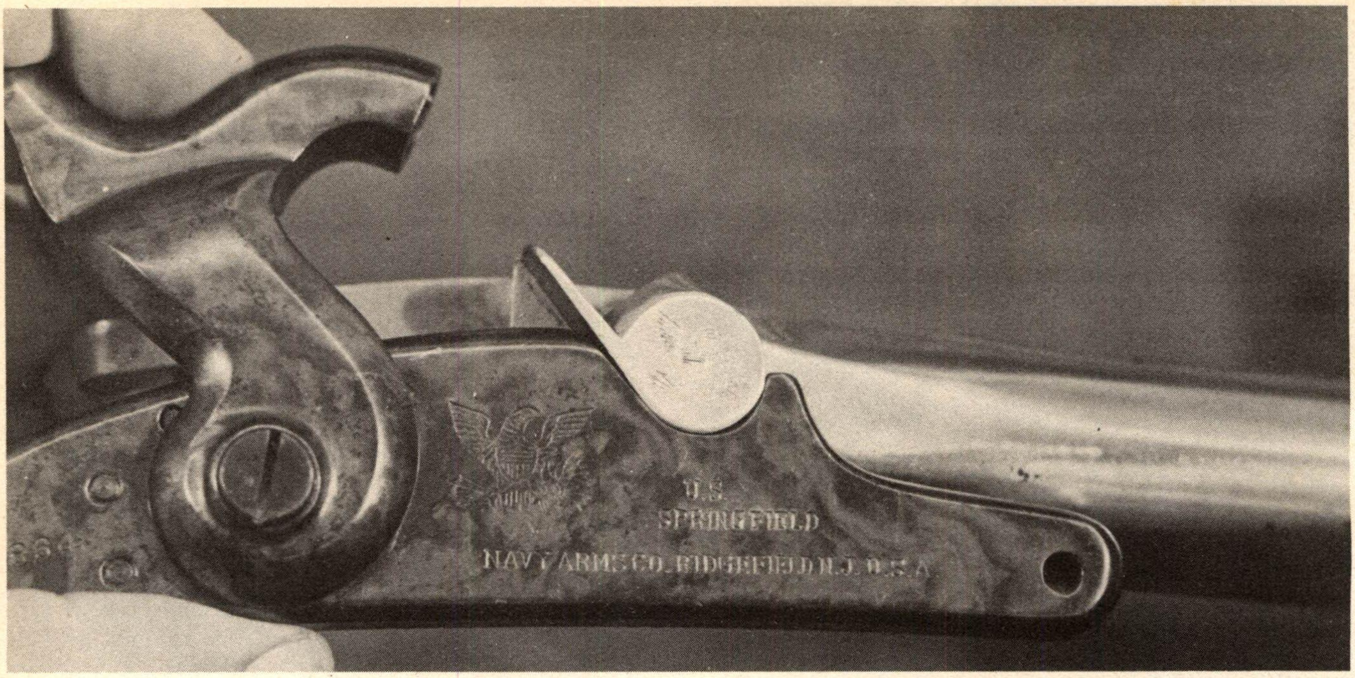
There are no instructions with the kit and, quite frankly, none are necessary. Lay out the parts and examine each closely. Their positions on the rifle are obvious. I would recommend that you place the trigger group together. As with all loose parts, a container such as the old favorite, an empty cigar box, will prevent stray parts.

The barrel and lock must fit close, with the cone seat of the barrel seating properly in its recess in the lock. The barrel channel and pre-inletted lock recess are unusually close to final position, with very little additional inletting necessary.

As with all machine-inletted stocks, there are the usual small slivers of fuzzy wood that must be cleaned up. Start in the barrel channel, using a large rounded-end scraper. Go from one end to the other with only mild pressure to remove the fuzzy slivers of wood and smooth up the barrel channel. Under no circumstances remove excess wood or enlarge the inletting! When smooth the barrel will press into place for an excellent fit with the tang, perfectly aligned with the tang screw hole. Actually, the inletting was so close that steel wool could have been used to remove the

*Flat wood scraper is used to remove slivers of wood from stock into which lock assembly will recess.*





*Without the stock, the barrel cone seats correctly in its lock recess, above. At right, the cone is not seated, due to extension block on back of lock, described in text.*

fuzzy wood slivers. In short, just smooth up the barrel channel and the barrel will press snugly into correct position.

The pre-inletted lock recess has the same light fuzzy wood slivers. Use small square-end wood scrapers to remove these. Take care not to enlarge the tight inletting, remembering this is strictly a clean-up operation.

Place the hammer on the half-cock notch, align the lock with its recess and press it straight in without tilting it to the side. At first, the lock appeared to be seated, but when the barrel was set in its channel and aligned with the cone recess in the lock plate, it was not fully seated at the top by about 1/16 inch. The tang screw was slipped in place to assure correct barrel alignment, but the gap was still there. The lock was removed and the inletting checked for burrs, as was the rear of the lock plate. Still, no solution.

In cases such as this, it is a mistake to just start inletting the lock recess at all points. Obviously, some spot on the lock or the recess is preventing full seating. This is the time to think your way out of the problem. Careful examination of the wood ledges that support the lock were even all the way around the recess. Examining the rear of the lock plate that rests on these ledges revealed no burrs.

Then I spotted the trouble point. The top of the mainspring is held in place by a block of metal cast into the rear of the lock plate. This block was at a higher level than the surrounding lock plate surface. For the lock to seat fully there had to be a recess in the wood for this block, yet there was no recess! To double check, I coated the rear upper surface of the lock plate with inletting black. When the lock was carefully reinstalled, the block was clearly marked on the wood, but no other part of the upper lock plate rear had made a mark.

It was a simple matter to inlet the wood for the block. After two cut and try procedures, the lock seated to full depth. This is a perfect example of slow, careful and thoughtful work as opposed to rushing in and making the chips fly!

The next step was to check the fit of the side screws that pass through the stock to hold the lock in place. The screws were turned in and out of their threaded recess in the lock plate several times to remove any burrs on the threads. Next, they were pushed through their pre-drilled holes in the stock. The rear screw jammed half way and was pulled out. The hole was correctly aligned with the lock, but just undersized. A few passes with a round needle file and the problem was eliminated. The screws aligned correctly with the lock plate.

The side-screw washers are countersunk on one side to match the screw head diameter. The stock is pre-inletted for the washers, but requires the usual cleanup of fuzzy wood slivers. The back edges of the washers were sharp and presented the possibility of edge cutting the wood recess during installation. To avoid this, the edges were beveled with a metal file. Next, the washers were placed in position and seated with several light blows with a plastic-tip hammer. The screws were installed and pulled up tight,

making the final full seating of both washers and the lock plate.

At this point it is necessary to assemble the components of the trigger guard assembly. They are wax die cast steel and, although very close to final shape, require polishing to a high finish to match the originals. The point now is to file only the amount necessary for each part to fit and function. In doing so they are fitted to the already assembled lock and barrel with correct function as the primary goal.

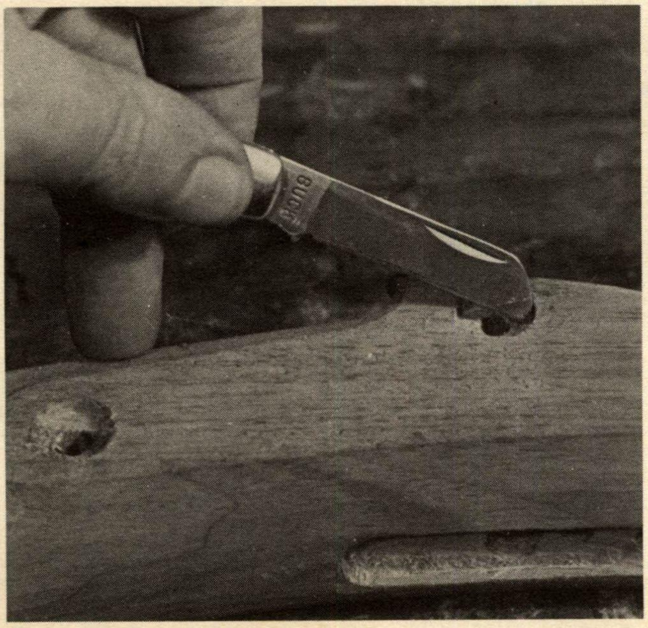
The main component is the long trigger-guard plate which fits into a pre-inletted recess in the stock. The first step is clean up of the inletted recess, removing the fuzzy wood slivers with a small, square-end scraper. Remember that this is a clean-up job only, and the depth and width of the inletted recess is not increased.

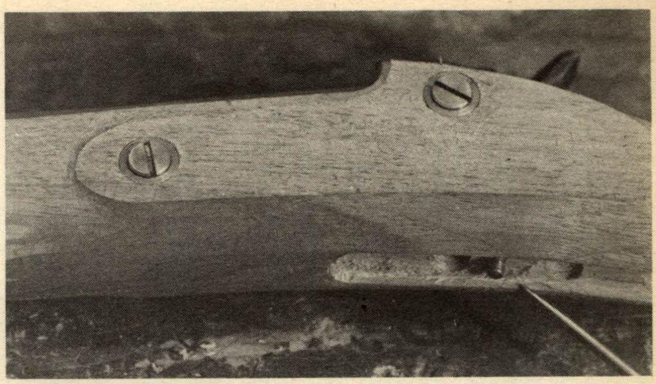
Look directly down on the top of the trigger-guard plate and you will see rough die cast marks. The top of the plate must be flat and smooth. Secure the plate in your padded vise and carefully draw-file both the front and rear. Take care to keep the file level; carefully file the outside of the round trigger-support stud removing as little metal as possible. Do not file the slot in the center of the stud. The top of the trigger fits in this slot, and this step will come later.

Now try the trigger-guard plate in the pre-inletted recess. On this kit it would just start in, and was obviously too large at all points. Inletting the wood more would be a mistake, as the edges of the plate are rough cast and the fit would be poor.

The correct method is to clean up the rough sides by filing, but this must be done slowly and carefully. Remember to angle the file inward about five degrees on the top side so that the smaller side of the plate enters the inletting first. Go slow! File a small amount all the way around and check your progress by attempting to install the plate. It is the same old cut-and-trial procedure until the plate presses firmly and snugly to full seating depth.

*Often, a good knife blade is one of the handiest tools for gunsmithing. Below, Buck Knife is used to clean out pre-inletted washer recess on left side of stock.*



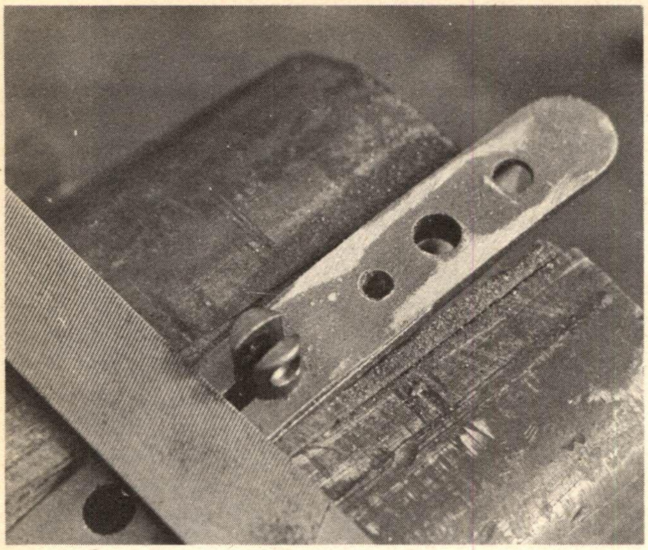
*Left side with lock, side screw washers and screws in place and pulled up. Pointer indicates trigger plate inletting to be cleaned up before assembly.*

The trigger goes in next and at first try it will appear that a lot of filing will be necessary. Wrong! There is a trick in installing the trigger through the slot. Slip the rear of the trigger blade fully through the slot, then pull back on the trigger and at the same time push the trigger up on its front. It will go right into place. On this kit the trigger entered the slot with no problem and the cross screw fit perfectly, but the trigger was binding. It was disassembled, the trigger blade lightly polished on both sides and the slot in the stud polished. When reassembled the trigger worked correctly without any side play. Too much polishing will free the trigger from binding but creates side-to-side play.

Next step is to check the tang screw that screws into the trigger plate and pulls it up tightly. Remember to check the thread fit with both parts out of the gun. The tang screw enters the threaded hole in the trigger-guard plate at a slight angle. To make assembly and disassembly easy, very lightly bevel the front end of the screw with a file. Note the angle of the screw when it is in place. Remove the screw. Hold a slightly larger drill in your fingers and twirl it to create a small bevel in the top of the screw hole. If the screw does not perfectly line up with its threaded hole during assembly, the two bevels act like a funnel and guide the screw into the hole. This is an old trick and can be used in many ways. It not only makes alignment easier but also helps prevent cross threading.

Reinstall the trigger-guard plate, with trigger assembled, into the inletted stock recess. Install the tang screw and pull it up tight. Now check the contact of the top of the trigger plate with the lock sear bar. On this kit the fit was perfect. If the trigger had been slack, with front and rear play, it would have been necessary to inlet the trigger guard plate deeper. If contact had been too much, the bottom of the trigger plate that touches the plate would have been filed to decrease contact. Remember to check at full cock, half cock, and with the hammer fully forward and resting on the nipple.

With the lock, barrel and trigger operating correctly, the rest of the parts can be installed on the trigger-guard plate. Remove the plate from the stock. The trigger guard bow ends pass through the plate, are stopped by flanges on each of the bow ends and secured by a nut on the threaded ends



*Initial session with draw file indicates more work will be necessary to bring metal of trigger guard plate to smooth, uniform appearance demanded by early gunsmiths.*

of the bow. The sling swivel end of the bow goes toward the muzzle.

On the first trial the ends of the bow would not pass through the trigger-guard plate holes. Close examination revealed that the threaded top ends of the bow were burred from the threading process. The burrs were removed. Next, the solid portion of the bow ends were lightly filed and polished, and the top of the flanges received the same treatment. The flange seats on the trigger-guard plate were also lightly filed and polished. This time the bow ends pressed easily into place and the two nuts were pulled up tight on both of the ends. The bow was securely in place and the trigger functioned freely without touching the bow.

Next comes the bow sling swivel, which is secured by a cross screw. The only fitting necessary was to clean and polish the points where the sling swivel pivots on the front of the bow. The cross screw fitted perfectly.

The complete trigger guard assembly is now reinstalled in the inletted stock. Remember that you have installed components on the top of the plate. In this case it was necessary to remove a very small amount of wood to clear the front trigger guard bow lock nut.

Install the tang screw, pull it up tight and recheck the sear and trigger. Select the correct size pilot drill and install it in a hand drill. As the two wood screws that secure the front and rear of the trigger-guard plate are quite large, it is best to use a center punch to prevent the pilot drill from wandering off to one side at the beginning. Drill the pilot holes, install both screws and pull them up tight.

It would appear that drilling a pilot hole for a wood screw is easy and no mistake is possible if the hole is centered. With few exceptions, the wood screws should be exactly ninety degrees from the surface level. If not, the screw will be cocked to one side. The pilot hole pilots the screw! Therefore, be sure it is drilled center and ninety degrees from the metal surface level. If a friend is handy, have him give east and west directions while you watch north and south to keep the hole straight.

While on the subject of installing wood screws, many people recommend oiling the screw. Oil swells wood after installation. I install them dry. The screw is cutting its seat, so make a quarter turn in, then back out a half turn, back in for a quarter turn, then back out a half turn. This creates a perfect seat for the screw and it can be removed and reinstalled many times without becoming loose.

The three bands, band springs, front sling swivel and nose cap are the next parts to install. Start with the solid front band. Press barrel and stock firmly together and see if it will slip over the two and back to its stop ledge on the stock. This one would not. Ease it forward and off the gun.

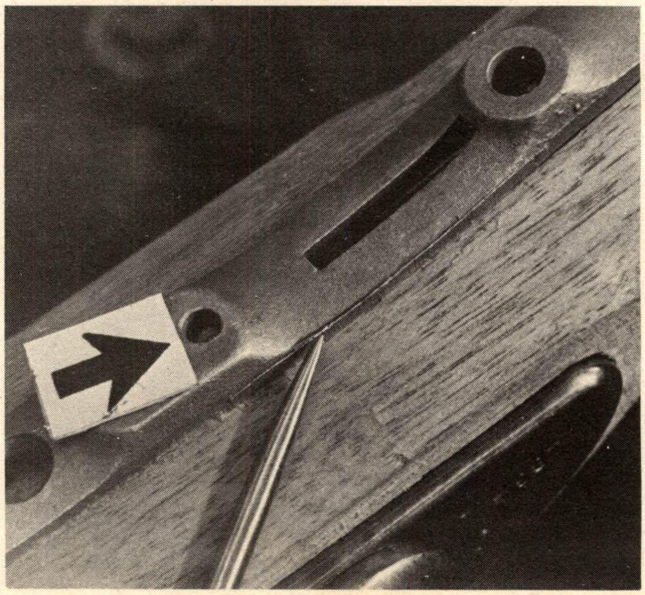
Use a polishing point in the Dremel Moto-Tool to thoroughly polish the inside of the band. Now try again. On this kit the band went back to its stock stop ledge for a firm fit.

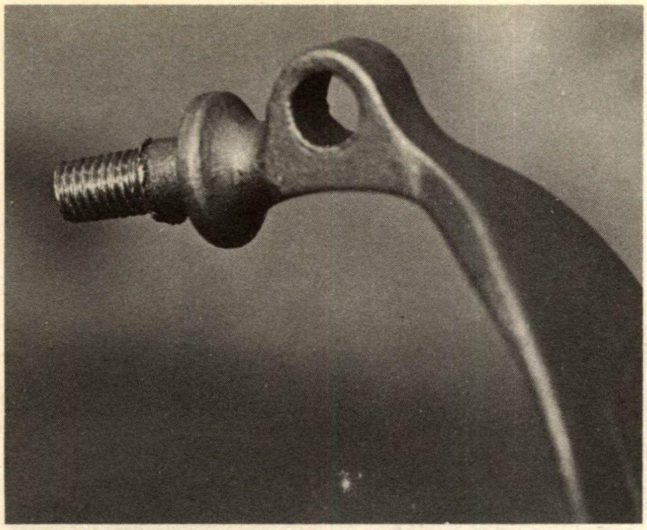
Next the center band, which holds the front sling swivel, was tried. It would not seat. Do not try to spring the band open! It is good steel, but you might crack the band and, in addition, the installation would be wrong. It was removed and polished the same as the front band but still would not seat. To double check, the sling swivel was installed, but the band still would not seat even with the lock screw loose.

As the top of the band's inner contour showed a small gap between it and the barrel, it was fairly obvious that the wood diameter was too large. To double check, mark the band's correct location on the barrel with a felt-tip pen. The barrel is then removed and the band held at the mark. The barrel contour and the inside upper band contour matched perfectly, confirming that excess wood was the cause of the band binding before reaching its position.

With the barrel out of the stock, the band was placed back on the stock and a pencil mark was made where it stopped. From this mark back to the band stop ledge on the stock was the place to remove the excess wood. It is important to remember that it is not the contour of the stock causing the problem, but the diameter of thickness of the contour. For this reason a wood rasp should not be used. A metal file removes less wood and, though slower, it

*Rough casting marks on sides of trigger guard plate, at pointer, prevented tang screw from tightening and pulling up plate. Arrow indicates tang screw hole.*





*Note threading burrs on front end of trigger guard bow. As noted in text, threads had to be cleaned up before bow would pass through trigger guard plate properly.*

is easier to control with less chance of removing too much wood.

Use careful strokes in removing the wood, taking care to maintain the original contour. Work directly only where the band front edge compresses the wood when slipped in place. Slowly but surely the band will move toward its stop ledge. When the band is within a half inch of its ledge, reinstall the barrel and check the work. This time the band came back to the half inch. The barrel was removed and the wood shaping continued until the band came back to its stop ledge. With barrel reinstalled, the band fit was snug and correct.

When the rear band was tried, the exact same thing occurred. The band stopped half way. Polishing the inside moved it back only a fraction of an inch more. The same procedure used to seat the middle band was repeated on the rear band. It would be a mistake to attempt to seat two bands at the same time. Go slowly, seat one band at a time and you will have a solid seat of barrel to stock and the bands in firm contact with both components.

The nose cap is tried next, with all three bands in position. Try it first as it comes out of the box. On this kit it would not seat. The insides were polished, plus the half curve that matches the barrel. Again it would not seat.

Back to the metal file to shape the excess wood. Note that the nose cap was a groove on the bottom that must match the ramrod groove in the stock. Start the nose cap from the front, the same way the bands were seated. It will compress the wood enough for you to see where excess wood is stopping it from moving back to its stop ledges. Watch the ramrod groove and remove only enough wood for the nose cap to seat correctly.

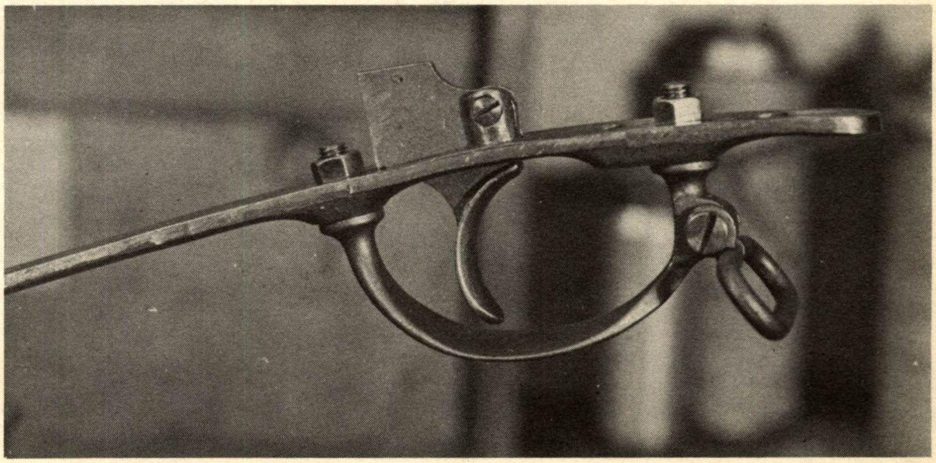
The nose cap is held to the forend tip by a screw passing down through the barrel channel into a pre-threaded hole in the nose cap. Be sure the nose cap is fully back and seated. With a scribe, press it through the cap from the outside and into the wood to mark the location for the screw hole. You can also use a sharp-pointed pencil to make the mark. Just be sure the mark is centered. Remove the barrel, bands and nose cap from the stock.

Select a drill smaller in diameter than the nose cap screw and chuck it in a hand drill. Lay the stock flat on your bench, belly up. Drill the hole taking care to keep the drill straight. Reinstall the nose cap on the stock and check to be sure the hole is straight and centered in the pre-threaded nose cap hole. If all is well, you can now use a drill the same diameter of the screw body or enlarge the hole with a round needle file. The purpose in using a small drill first is to allow for a mistake which can be corrected in enlarging the hole to its final diameter.

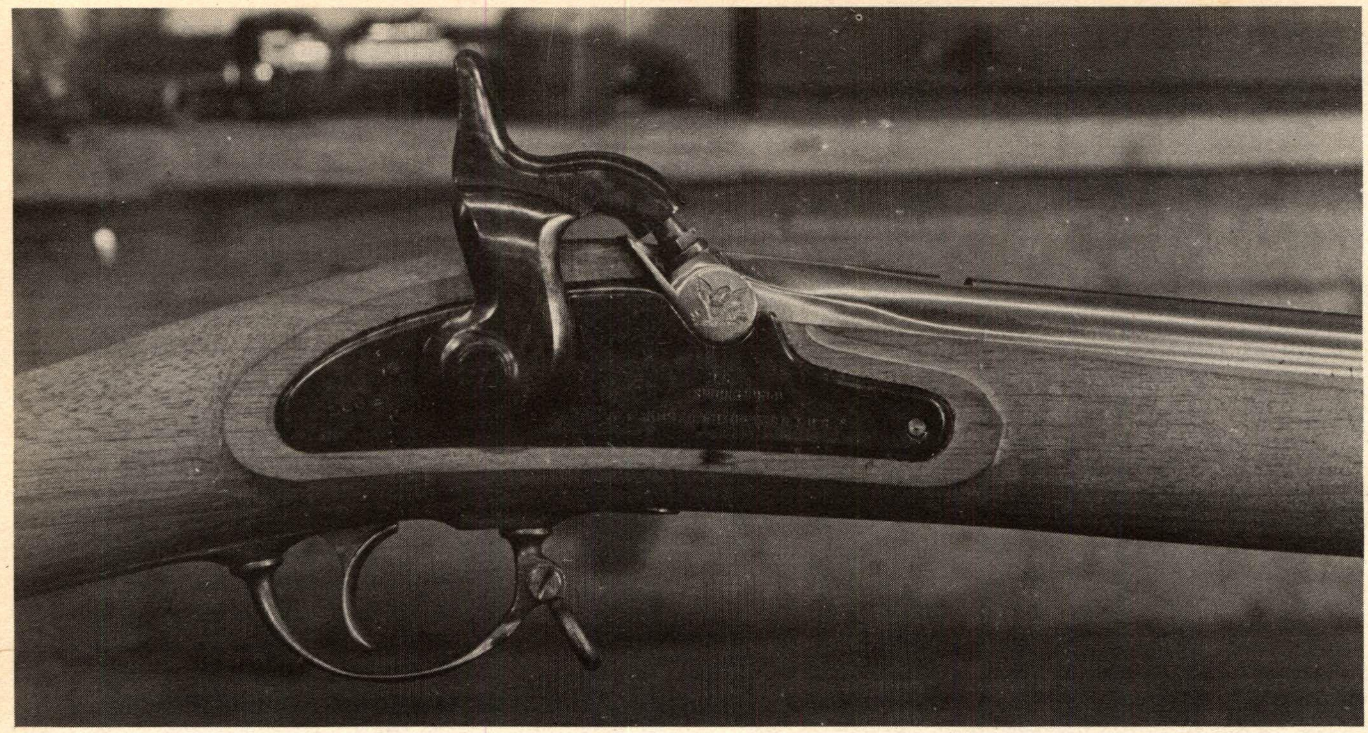
Next measure the diameter of the screw head. Select a drill of the same diameter or a wee bit larger. Using a hand drill, make a countersink in the hole in the barrel channel. The head of the screw must be seated below the channel surface and not touch the barrel. The wood is thin at this point, so keep the countersink as shallow as possible. Check the thread fit in the pre-threaded hole, then install the nose cap, insert the screw and pull it up tight. Check the job by installing the barrel and the front band. The nose cap should be correctly seated. If the screw protrudes, file it flush with the surface of the nose cap.

The band springs are next and must be installed with the bands off the stock. All three are identical, so first polish the front surface. The ends near the pins must be rounded to match their pre-inletted recess in the stock, but do not round the other ends or alter the step as this fits against the front edge of the bands. Lightly polish the pins and round their ends.

The springs are best installed with the barrel in its channel to prevent cracking the thin stock as it is held in



*Completed trigger guard assembly ready to install. Parts still need final filing and polishing.*



*Assembled barrel, lock and trigger group have been mounted on stock and are now ready for test firing.*

your padded vise. With the band and spring recess extending just past the vise, use a plastic-tip hammer to drive the spring pins into the stock. Use a pin punch to make the final spring seating. Repeat on the other two band springs.

All three pins will protrude on the opposite side of the stock. The Dremel Moto-Tool and a cut-off wheel will slice through the pins in seconds. Finish up by filing the pin ends flush with the stock surface. The bands should now slip back in place; compress the spring and the spring snaps back up with its shoulder locking the band in position.

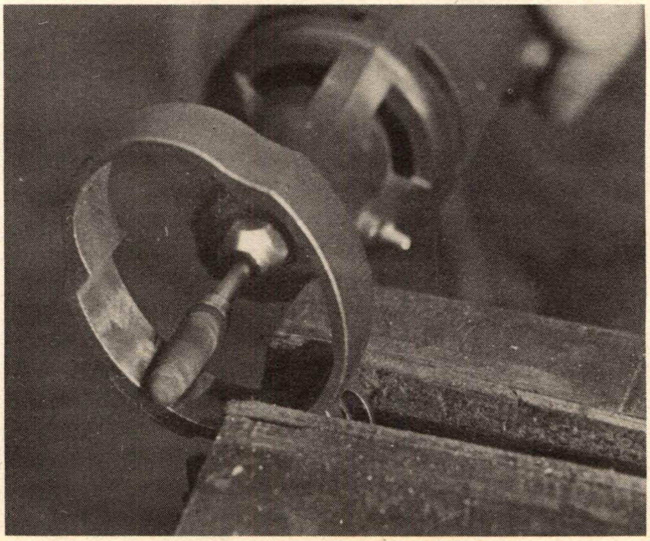
On this kit the front band and spring step were correct and the middle and rear bands did not go back enough for the spring step to snap up in place. You can either file the spring step shoulder forward more or file the band wood step back until the spring snaps into position. I chose to file the wood as it is easier. Just be sure your file has a safed edge, remove a little wood, then check and file more until the band spring snaps into position securing the band.

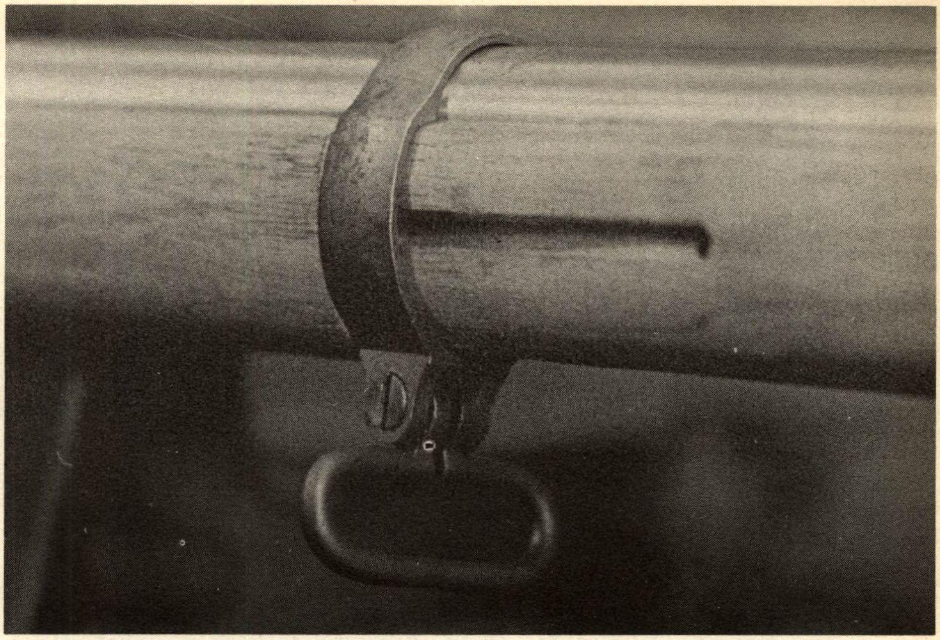
The front sight is already attached. The rear sight with its attached blade is held to the barrel by a lug on the bottom of the sight base fitting into a square notch in the barrel, and also by a large screw at the front of the base and a pre-threaded hole in the barrel. The screw does not have the usual slot, but two holes in its top like the original. A special wrench was used at the armory to install the screw. You can make one by grinding out the center of a screwdriver, leaving two prongs like the capital letter U or use a modern spanner wrench. The simple way is just to use the tips of a pair of needle-nose pliers.

Set the sight on the barrel and tighten the screw. Now, look closely at the rear lug and the barrel slot. On this kit the lug was not fitting the slot. The front part of the lug was all right, but the slot was too short at the rear. This is a square slot, not a dovetail, so use a narrow pillow file with a safed edge. Cut the slot a bit at a time, rechecking by installing the sight until the lug fits down into the slot. Remember that the screw hole cannot be changed, so install the screw each time you check your filing progress. When the sight lug fits, pull the screw up tight.

With the L-shaped blade folded down, the V on the short end is for one hundred yards. With the long end of the blade up, the top V is for five hundred yards. The center hole in the blade is not a peep sight. On the original gun it is simply a hole to see through with a V-notch at the

*Dremel Moto-Tool with polishing point smooths up inside surfaces of front band. Inside is polished first while outside is left until finishing stage.*





*Middle band, including front sling swivel, fully seated to stop ledge. Stock was first filed down for close fit to polished interior.*

bottom of the hole for three hundred yards. This V-notch is not cut in the kit's sight, so use a triangular needle file to cut it at the bottom of the hole.

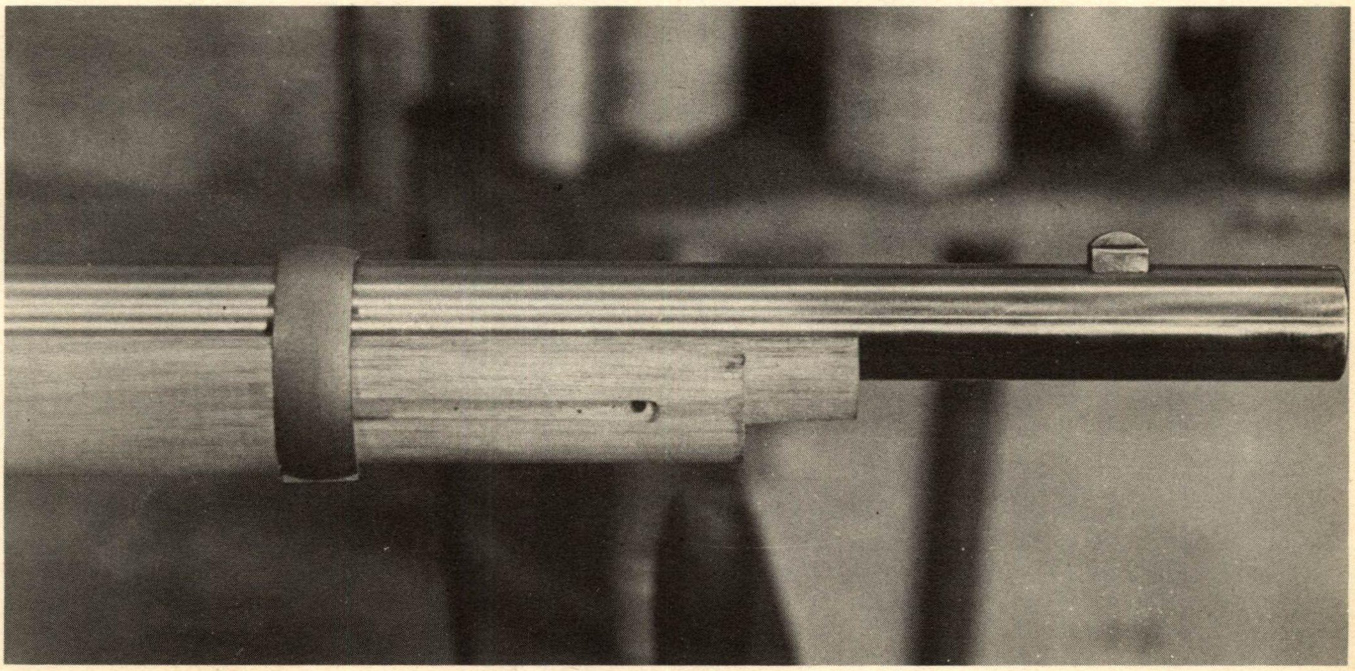
The butt plate is already fitted to the stock on this kit, so the initial assembly is complete and the gun is ready to test. Following usual procedure, I cleaned the bore of all oil, placed a cap on the nipple, brought the hammer back to full cock and pulled the trigger. The cap did not fire! I waited a minute in case of a hang fire, re-cocked the hammer and again the cap did not fire. Thinking the cap was bad, I replaced it, wiped the nipple clean and tried again with the same results. A third cap gave the same negative results.

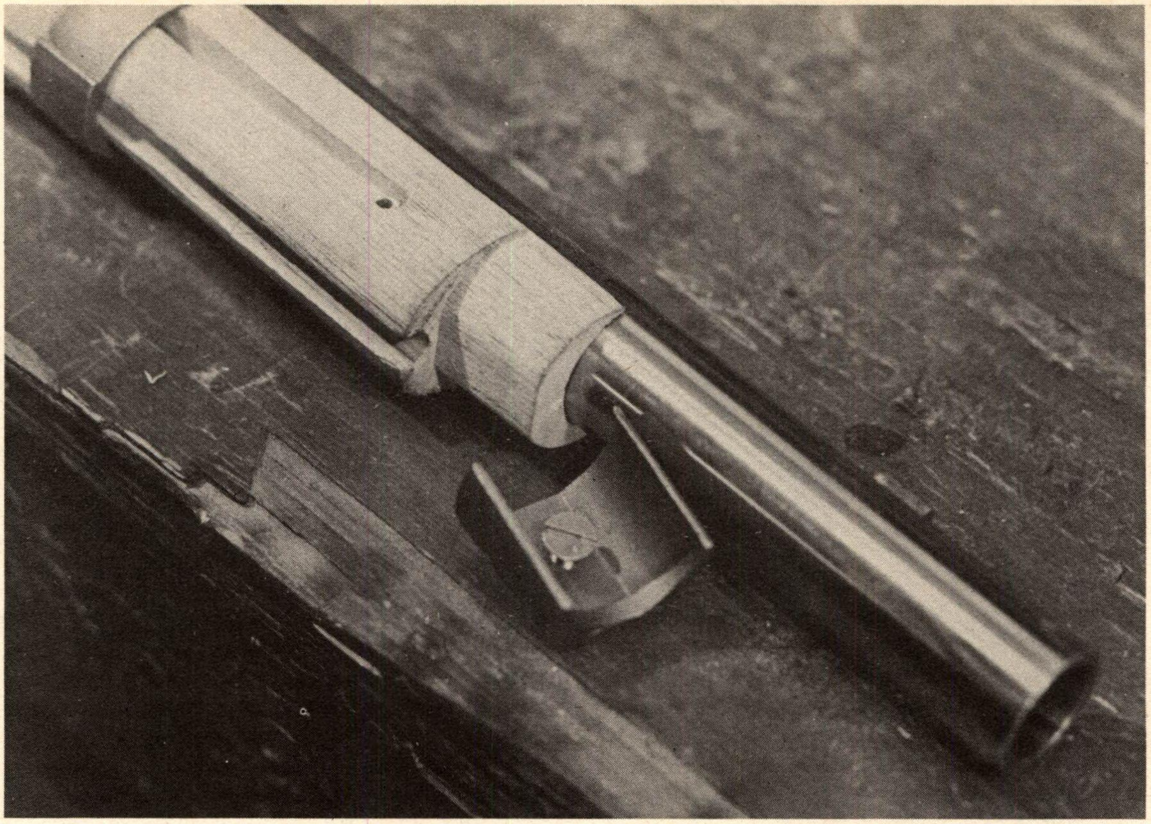
I removed the lock, checked each of its components, cycled the lock and it worked perfectly. The mainspring was correctly in place and strong all the way down. Obviously, something in the lock inletted recess was binding the lock.

Using a magnifying glass, I examined the lock recess carefully. No sign of compressed wood was seen. Then I tilted the stock up and spotted the problem. When the spring was almost at fired position, it was hitting the wood. It had compressed the wood some, but obviously was binding. With a small inletting chisel, I cut away the compressed wood and a bit more to give the spring full freedom.

The lock was reinstalled and I fired six caps in sequence without a misfire. The lock was removed and the inletting

***Front solid band has been polished on inside and seated correctly back to stop ledge of stock, without band spring.***





*Nose cap is unattached to illustrate how holding screw comes through hole in cap. Hole must be drilled in forend to match pre-drilled and tapped nose cap. Forend hole is countersunk so screw metal doesn't touch barrel.*

was checked. No sign of compressed wood was seen. The lock was reinstalled and six more caps fired perfectly, although three of the caps were purposely not fully seated as an extra check.

What caused the malfunction? I honestly do not know, but I can make an educated guess. I had checked the function of the lock at every normal step. The most logical reason is that when the bands were installed, they pulled the barrel down more, which in turn pressed the cone and cone seat down just a fraction of an inch. That small amount was enough to shift the lock and bind the spring as the inletting was very tight.

Two important lessons are pointed out by the malfunction. First, the checking of the function of the action as each component is attached is very important. The same malfunction could have occurred at any stage in assembly. Second, the final inspection prior to test firing should be done with only the primer and the gun should not be loaded. A correction had to be made at the last minute. It was reassuring to make it on an empty, rather than a loaded gun.

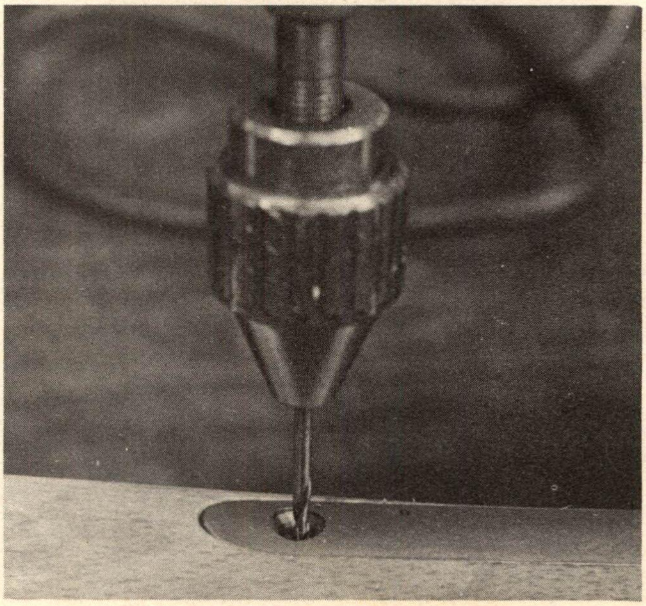
The final test is always shooting the gun. Start with a reduced powder charge and work up slowly to the full powder load. Then, with the gun empty and cleaned, check every component and assembly to assure correct function.

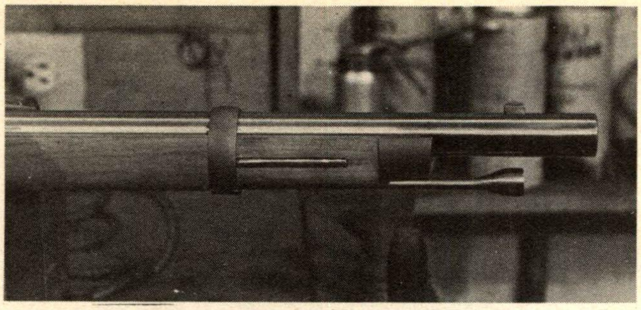
With the gun disassembled, finishing the metal is easy. The original Model 1864 metal, with the exception of the color case-hardened lock, was finished in the white. A few of the 1863 models had blued bands and rear sight, but all 1864 models specifically omitted this.

Use your regular files and the set of needle files to remove all casting marks and to remove the dull cast finish. Now switch to aluminum oxide cloth. Use this with a backing, such as files and blocks of wood, to bring the metal closer to a high polish. Go over every piece and component; do not skip a spot.

With a polishing point in the Dremel Moto-Tool, polish

*Pilot drill in hand-powered drill must be held at precisely 90 degrees with surface of trigger guard plate, centered exactly and level with stock.*





*When fitted correctly, front band, band spring, nose cap and ramrod should appear as above.*

each of the parts and components to a high finish. The polishing point is small and will leave small light-reflecting waves that make the metal appear uneven, although it is smooth. For the final step, and to remove these reflections, use four aught steel wool. The steel wool, when pressed against the metal and worked rapidly, will burnish the metal and leave a luster that matches the original finish. Finally, oil all parts thoroughly to prevent rusting.

When in use, the original metal was kept bright and in the white. In combat, in bad weather and trying conditions, the metal rusted and was oiled. It was a natural slow-rust browning. If you want to duplicate this, use a saline solution of common table salt and water. As the parts rust, wipe hard with a dry cloth to remove the excess rust. Then apply another coat of the saline solution. After about six coats you will have a dull red color. Now oil heavily, rubbing the oil in thoroughly to stop the rusting. Reassemble the gun only after the oiling.

The stock is very close to final shape. Use metal files instead of a wood rasp to shape sections as necessary. It is more a matter of blending existing contours than the usual shaping operation.

The original stocks were made from American black walnut. The walnut in this kit was light in color. Use a good, water-based walnut stain cut fifty percent more than the manufacturer's specifications to stain the stock after sanding. These multiple thin coats of stain allow more control of the shades on a long stock. After each coat of stain, rub the stock with steel wool. This way you both whisker the stock after each coat of stain and also burnish the wood. The stock should be dark walnut.

The original finish was pure linseed oil. If you want to copy this, buy a small can of boiled linseed oil, which is just rubbed into the stock with about a dozen coats required. After the final coat, rub the stock hard with an old bath towel.

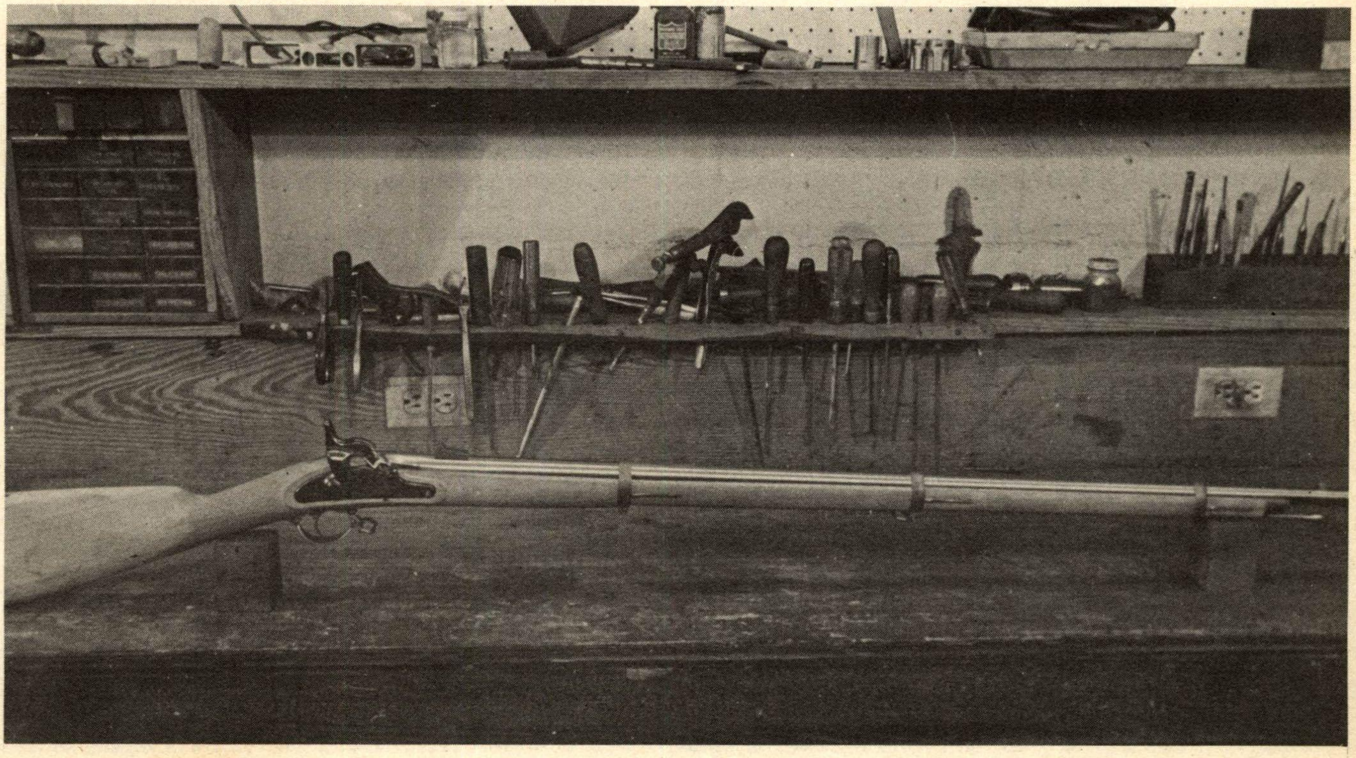
Any modern stock oil finish, such as Tru-Oil, G-96, Linspeed and others, can also be used. The only requirement is to compound the high gloss final coat back to a soft velvet sheen.

After the wood is finished, reassemble the parts and components. Check for finish build-up and remove any that prevents the components from functioning. Make the percussion-cap-only firing test before a regular load. Your kit is now complete and ready to use and admire.

On October 15, 1865, Brigadier General A.B. Dyer, Chief of Ordnance, advised Secretary of War E.M. Stanton that work had started on converting 5000 rifle-muskets to breechloaders at the Springfield Armory.

It was the end of the muzzleloading rifle-musket. Only 255,040 Model 1864 rifle muskets were manufactured by the Springfield Armory. Although it was the last regulation rifle-musket, it is considered by many authorities to have been the finest.

*Navy Arms 1864 Springfield rifle-musket replica completely assembled and ready for test firing/final finishing.*



CHAPTER 14

# MUZZLELOADING ACCESSORIES AND ACCOUTREMENTS

*Handmade hunting bag with Indian bead work frill.*

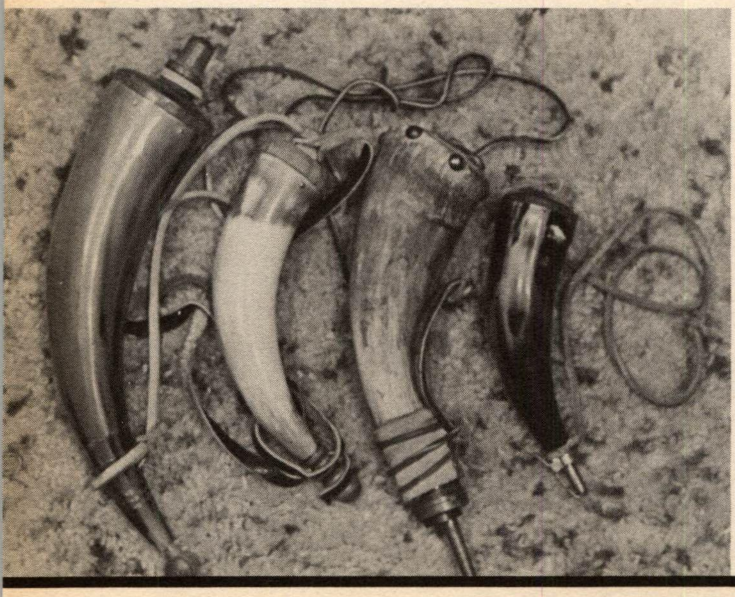
ONE OF THE pleasures associated with black powder guns is the array of accessories and accoutrements that is almost unlimited in choice. The choice can be simple or complex, and the items can be purchased ready to use, in kit form, or made from raw materials.

Since the muzzleloader consists virtually of hand-loading for each shot, the basic components of projectile, powder and igniter must be carried into the field or to the range, and each of them must be loaded in the gun.

Some form of powder container is a necessity. One of the old ways of shipping and selling small quantities of black powder was in a sealed, lead container. The seal was broken and the powder poured into a large container such as a big powder horn. The lead container was then melted down for bullets. The first use of a horn as a powder container is lost to history, but it persists even today. Almost every type of horn has been used and many of the originals are literally works of art. Although buffalo, goat and other horns with a natural cavity have been used, horns from cattle are the most prominent.

No two horns are exactly alike, adding to the attraction, but powder horns fall into three general categories. The first is the storage horn – for lack of a better name – and, as the description implies, it was as large as possible. Next and most common is the field horn, varying in length from about twelve inches down to around six inches. The third is the priming horn for flintlocks, usually not over six inches in length.

There are two schools of thought concerning what the wall thickness of a powder horn should be after the rough, outer scale is removed. On some the wall is left relatively thick to accommodate carved decorations ranging from names and simple scrolls to elaborate game scenes. On others, the walls are scraped thin, so that when held up to a



*From left: Large storage powder horn by CVA, small field horn restored, old damaged horn restored by adding spring-loaded cut-off head, and small primer or pocket horn with rocker-type spring-loaded cutoff.*

strong light the amount of powder remaining in the horn is visible.

When immersed in hot water a horn softens and can be shaped by pressure. Using this principle, horns often were flattened between two boards so that when cold and dry they retained this flattened shape. They were finished in usual fashion, but most were made to be carried in a pouch or pocket.

The base of the powder horn is closed with a wooden plug that usually has a knob for attachment of a leather thong. Some plugs are shaped to match the contour of the inside of the horn, while others are round; the horn soaked in hot water to make it pliable and shaped to match the plug. Large brass head tacks usually are used to secure the horn to the wood. On some horns the knob unscrews to allow easy filling of the horn.

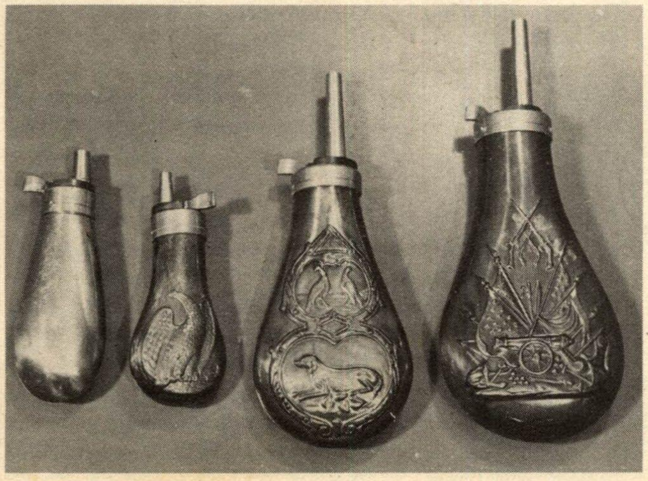
The front ends of traditional powder horns usually have a groove for a leather carrying thong. A plug is either pressed into the small, powder-exit hole, or is threaded. Usually the plug has a short extension of the leather thong to prevent its loss. A variation is the spring cap. A simple lever on the side of the horn is pressed and the front of the

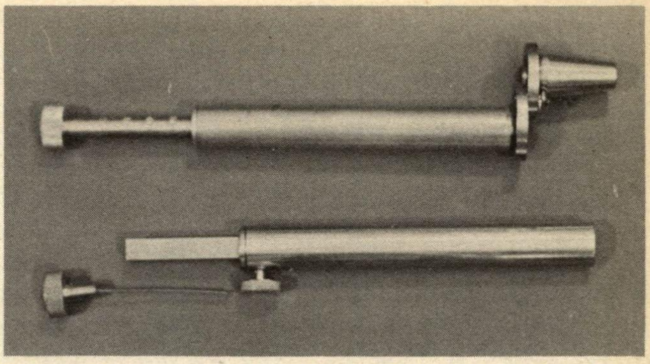
## The Ability To Build, Repair And Make Recommendations To Shooters On Certain Accessories Is Essential

lever uncovers the powder-exit hole. Release the lever and a spring closes the hole by pushing the back of the lever up and the front end down and back over the powder-exit hole.

The traditional powder horn uses a separate attachment with a hole bored deep enough to hold the correct powder charge. This also is attached to the horn's front end with a short piece of leather thong. The end tip of a piece of horn

*Four modern powder flasks include, left to right, bag type, .31 Colt flask, Remington dog scene and large Colt.*





*Adjustable powder measures from Michaels, top, showing built-in funnel moved to side for loading and Nicky measure with increment rod pulled down and locked. Knurled screw is removed to show built-in nipple pick.*

usually serves as the material for the powder charge attachment. Brass tubes were also used, as was other material. Many shooters prefer to attach an adjustable powder measure for this purpose, thus facilitating different charges for light plinking loads or full hunting charges.

A growing number of shooters prefer the automatic powder measure tip, which eliminates the separate plug and powder charge container. In its simplest form, it is a brass tip for the powder horn. A spring-loaded plunger seals the powder-exit hole. In use, the forefinger is placed over the end of the brass powder measure tube and the spring-loaded plunger depressed, which opens the powder-exit hole. The front of the horn is lowered and the powder fills the brass measure tube. The spring-loaded plunger is then released, closing the powder-exit hole and leaving the brass measure tube full of powder. The end of the tube is held over the gun muzzle, the forefinger removed and the measured powder charge goes down the bore. Some variations of this style have screw-in brass-measuring tubes so powder charges can be changed by installing various length tubes.

A further variation, usually to achieve a shorter powder horn, uses the charge cap assembly from a powder flask. Incidentally, this is a good method to use for salvaging an old powder horn that has the front end damaged. Naturally it should not be used on a classic, antique horn whose artistic value exceeds just putting a horn back into use.

Powder horns offer a lot of challenge to the kit builder. All variations are available and, even as a complete kit, no two will be exactly the same. In addition, the individual finishing possibilities are unlimited.

The primary difference between a powder horn and a powder flask is simply that a flask is made from material other than horn! Early flasks were made from wood and coated with some form of water repellant. If you want to make one, all you need are three pieces of hardwood.

The core is a thick piece of wood with the inside cut out to form the powder cavity. A one-inch or 1½-inch-thick piece of wood is sufficient. Use a coping saw to cut out the inside, leaving a one-half-inch edge. The other two pieces of wood are about one-quarter to one-eighth-inch thick and left solid. Glue the two thin sides to the core, sandwiching it between. When the glue is dry, finish shaping the three pieces and sand until all edges blend. After drilling the powder-exit hole, apply about four coats of shellac to waterproof the flask. Obviously, the external shape, decora-

tions and even the wood leave a lot of latitude for personal ideas.

The metal flask is a whole field of collecting in itself. In fact, Ray Riling wrote a 520-page book, *The Powder Flask Book,* on the subject. A smaller book with the same title, but by Martin Rywell, is available from Dixie Gun Works. The latter book deals more with building, repair and restoration.

Just about every metal, except steel and iron for obvious spark reasons, has been used to make powder flasks. Brass and copper are predominate choices. Basically, the body of a flask consists of two pieces of sheet metal. The two sides are formed under pressure in matching male and female molds. This forms the sides and impresses the chosen design and decoration. The two formed sides are then soldered together, forming the flask cavity body that holds the powder. The top is sealed with a cap containing a spring cut off as already described, and the powder measuring tube.

Until the reproduction-replica era, powder flasks were expensive and difficult to find in good working condition. The flasks made today closely resemble the originals and span the whole flask-size range; from the small .31 pistol flask holding about 1½ ounces of powder with a charger spout dropping 10.0 grains of powder, up to the large rifle flasks holding close to a pound of powder and dropping 70.0 grains of powder in the charger spout. Extra screw-in charger spouts to hold a desired powder charge or to be cut in length for a special charge are available for most flasks.

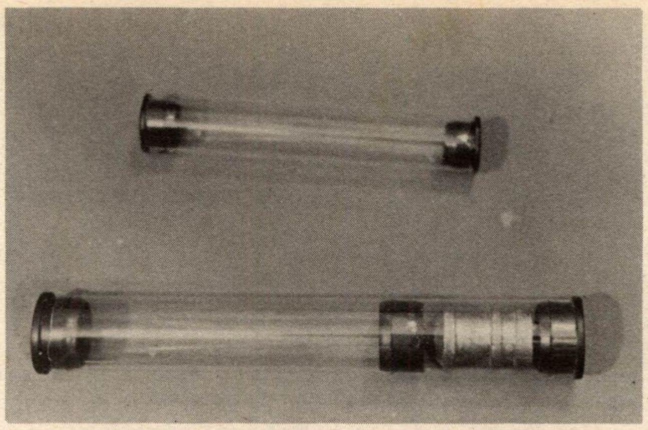
A recent addition is CVA's tubular flask. The screw-off end cap makes filling the flask much easier. The top uses a similar cap, with the conventional spring powder cut-off and screw-in spout. Spouts to hold 22.0, 33.0 75.0 and 100.0 grains of powder are available.

Powder flasks similar to the large rifle flasks are available for shotguns, but with the powder charger designated in drams. The shot usually is carried in a leather pouch to cut down on rattle. While several types are available, the most common form is with a spring-loaded rocker charger. In use, the front end is down, holding the shot in the measuring tube. When the rear of the rocker is pressed down it cuts off the shot, leaving the desired shot charge in the measuring tube, while the front end raises to allow the shot to exit the pouch. A similar rocker sometimes is found on shotgun flasks.

Regardless of whether you choose powder horn or powder flask, an adjustable powder measure is desirable as it allows the measuring of powder charges to find the best load or loads for a rifle or pistol. There are several on the market, but two are, in my opinion, hard to beat. Both are of machined brass.

The Michaels' adjustable measure is adjustable in 10-grain increments from 0-120.0 grains. You simply turn the brass knob at the bottom of the measure a quarter turn to the right and pull down to the desired marked grain line, then make a quarter turn back to the left to lock the setting. Pour the hollow tube at the top level with powder, then swing the top funnel over the tube to brush away any excess powder and use the funnel to pour the charge in the gun barrel.

The Nicky adjustable measure is distributed by Dixie and Brownell's. It provides measured charges from 0-125.0 grains, and has five-grain increment measurement marks. To use, the knurled screw on the bottom side is loosened, the measurement bar pulled down to the desired charge and locked in place by the same knurled screw. The tube is then filled with powder, leveled off and poured into the barrel. The bottom knurled knob unscrews and has a handy nipple and touch-hole pick.

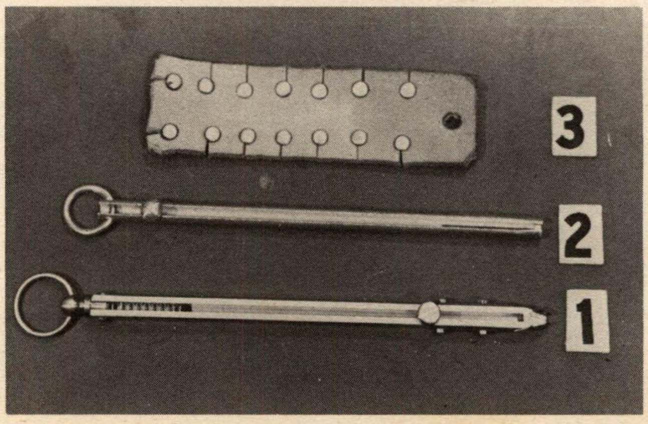


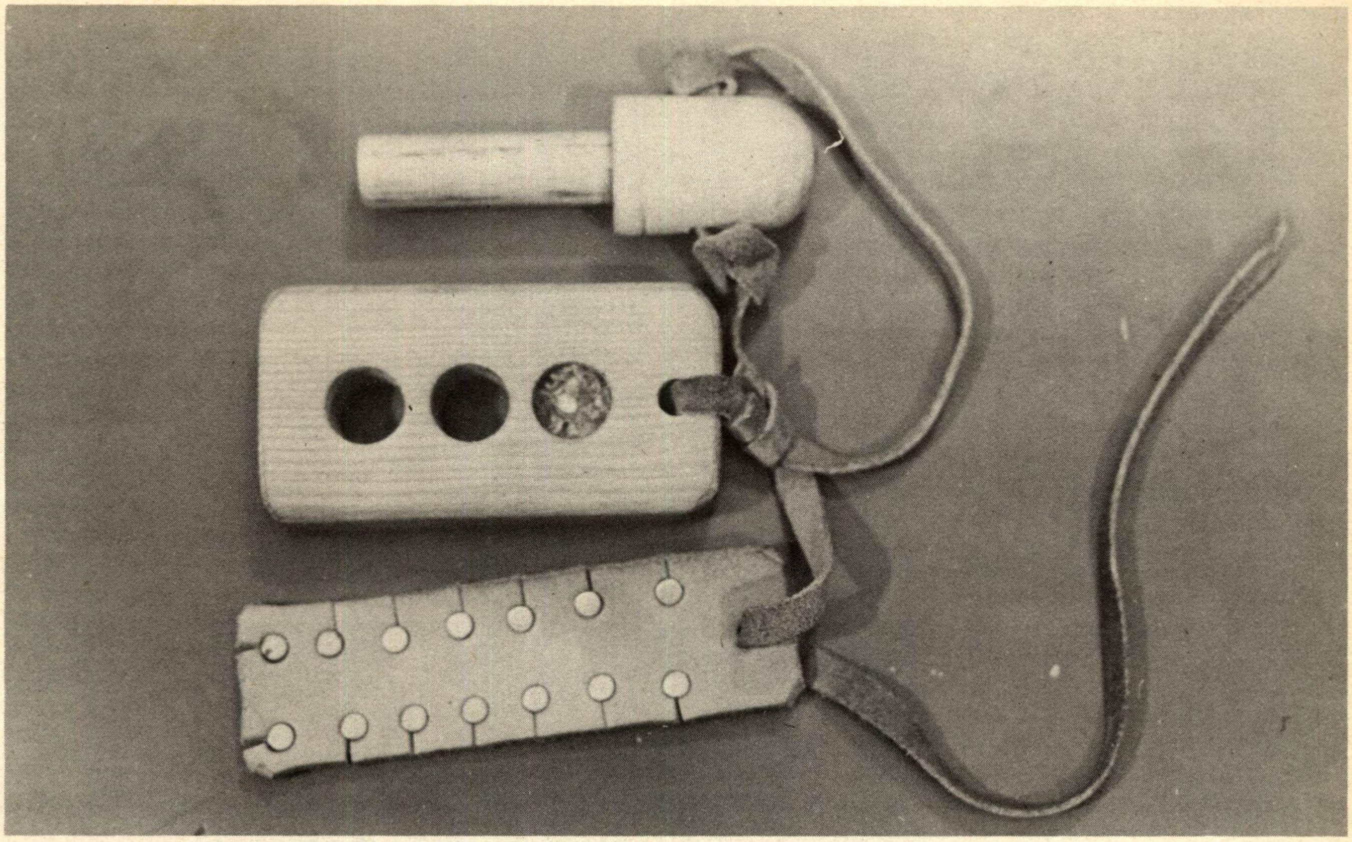
*Brownell's Celluplastic Chargers are available in two styles; for premeasured powder charges only and with plastic separator holding powder and Maxi ball. Each is reusable, waterproof and costs less than ten cents.*

The idea of carrying a series of pre-measured powder charges dates back to the matchlock. The paper type cartridge used in the original guns, primarily military, combined a pre-measured charge and the projectile. Many are used in today's replicas but they have two major problems: first is protection from moisture; secondly, extreme care must be used as quite often bits of the paper remain in the bore after firing. A fresh charge of powder on a smoldering piece of paper can result in ignition of the powder.

A more common and safer practice is to carry the pre-measured charges in small, plastic-capped pill bottles. Some shooters glue two bottles end-to-end and carry the projectile in one of the bottles. Other charges are made from brass tubing fitted with plastic caps on each end, one to hold a patched ball and the powder charge in the other.

*Handy cappers are available in various styles such as leather variety made by Ralph Walker holding 14 caps, Number 2 is by CVA and No. 1 is from Michaels.*





*Ralph Walker's homemade ball starter, .50 caliber three-shot bullet block and 14-cap leather capper held by leather thong.*

Some even have a small flange on one of the caps to hold a percussion cap.

Perhaps I am a bit prejudiced as I helped develop it, but I feel the Brownell's Celluplastic Charger is the best and most economical answer. Sold in eighteen-inch plastic tubes in three-eighths, five-eighths and seven-eighths-inch inside diameters, the tubes are clear and have caps that insert inside the tubes with an outside flange for removal. A spacer, similar to the caps but without the flange, separates projectile and powder. You first insert the spacer, pushing it up to make room for the projectile, then close this end with a cap. Next pour the measured charge in the other end of the tube. Leaving room for the cap, you cut the plastic tube off with a sharp knife or scissors and then install the other cap.

Once you have the desired length, the rest of the tube is cut to similar length for additional charges. Cost is around ten cents per charge, less with smaller loads. It is waterproof and the divider prevents a greased bullet from contaminating the powder. An added feature is the flexible plastic. When pouring the powder charge you just pinch the tube end partially closed. If you want just a measured powder charge, the tube is cut to shorter lengths. They can be reused dozens of times.

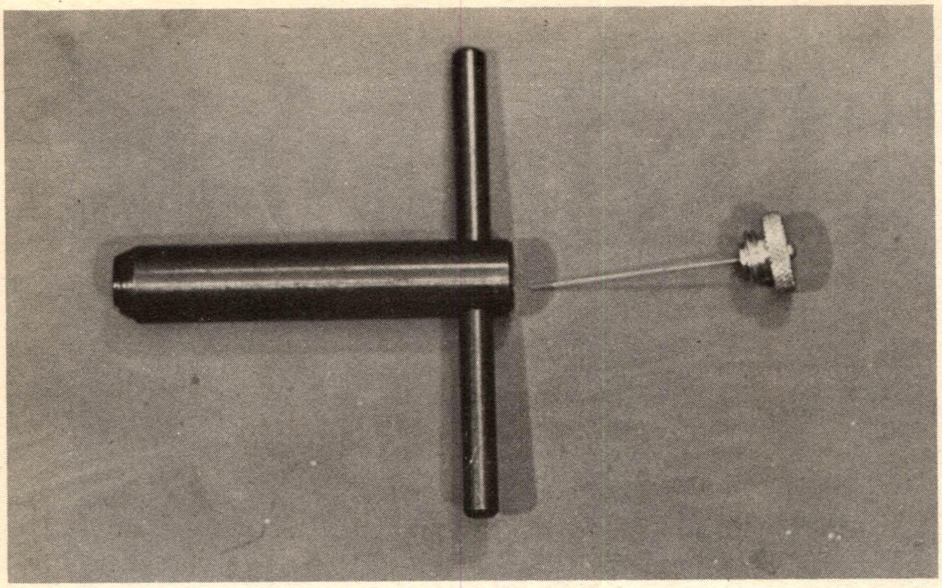
Carrying percussion caps is easy in the original box. The problem is picking up one of the little rascals and getting it on the nipple! Devices to hold the caps in correct alignment and allow them to be installed vary considerably in design and construction.

A simple homemade capper can be made from a stiff strip of leather of about the same thickness as the percussion-cap length. A leather hole puncher is used to make a series of holes along each edge of the leather, in which the caps should fit snugly. Next, a notch is cut in the outside edge of each hole. With a cap in place it is placed over the nipple, pressed down with the thumb and the leather then pulled away, allowing the cap to exit through the notch in the hole.

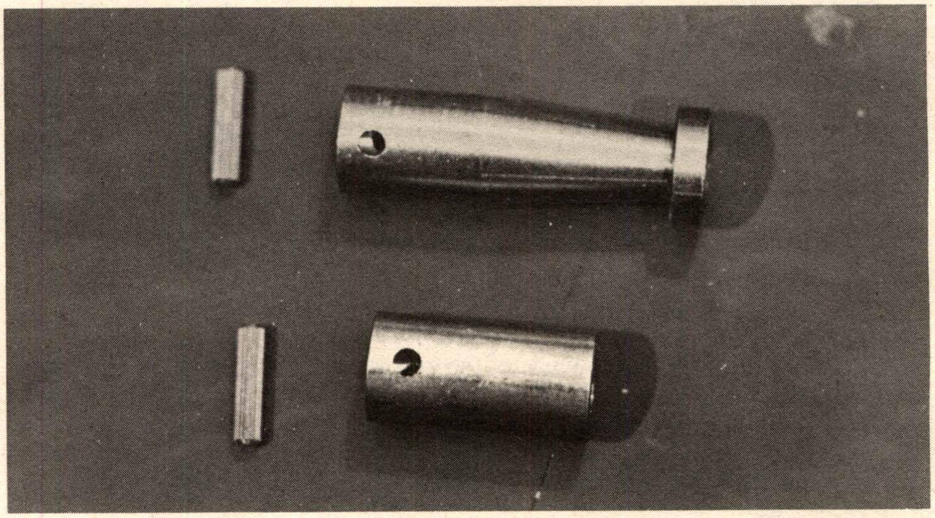
The homemade leather capper is best for the top hat-type musket caps, unless you purchase a copy of the metal military capper from Dixie Gun Works. There are two excellent and inexpensive cappers for regular percussion caps.

The Michaels Capper is made from extruded brass and performs perfectly on rifles, shotguns and revolvers. The thumb piece is pulled to the rear, compressing the spring until the hole on the back is open. The caps are dropped through the hole, open end down, until the capper is full. Two spring clips on each side of the capper hold the cap in position; an extension on the top prevents the cap from falling out. To use you just place the cap over the nipple, press down and the extension seats the cap. Pulling the capper at a right angle from the seated cap allows the spring clips to release their tension. A brass ring on the rear can be used to attach a leather thong.

The CVA Straight Line Capper looks similar, but is a round tube with the front end partially closed. To load it, place the percussion caps on a flat surface, the open end down. Hold the capper vertically and press the front end down over the rear of the cap until the capper touches the



*Michaels' deluxe nipple wrench. Removable brass cap contains nipple pick and room for two nipples or one nipple, one cap.*



*Replacement ramrod tips are of machined brass, with cross pins. Both tips are tapped, while lower model is designed to accept cleaning accessories.*

flat surface and the cap will be pushed back into the tube. Repeat until the thumb button on the capper is back to the brass ring. To use, hold the capper directly in line with the nipple, your thumb on the button, push straight down to seat the cap, then pull the capper straight back and the cap will be seated on the nipple.

While on the subject of percussion caps, Forster Products offers an interesting device called Tap-O-Cap that allows you to make your own number 11 percussion caps! First, cut out the top and bottom of an aluminum beverage can. Split the can down the middle with a pair of scissors and flatten the split can to form a sheet of aluminum. Next, cut the sheet into three-quarter-inch-wide strips. Insert one of the strips into the feed slot of the Tap-O-Cap body, unpainted side up. Insert the punch in its hole in the body and place the base of the body on a solid base. Use a plastic-tipped hammer to tap the punch. Extract the punch, invert it and your formed cap will fall out the exit passage. Repeat until you have a supply of formed caps.

Next, go down to the local dime store and buy several rolls of toy pistol caps; should cost about a buck for 1500 caps! A special three-sixteenths-inch punch is furnished to punch out the charge discs from the roll of toy pistol caps. With a supply of discs on hand, moisten the tip of the one-quarter-inch wood dowel that is furnished, press it on a disc, then insert the disc up into your formed cap, pressing it firmly. One disc usually is all that is required, but you can install two or even three if you want maximum performance. Follow the instructions that come with the kit. The device is simple to use, a lot of fun, and the percussion caps perform perfectly at a fraction of the cost of purchased caps.

One more item before we leave percussion caps: There are several special nipple devices that use a regular rifle or pistol primer instead of the regular percussion cap. Most use some form of spring to hold the primer in place. Anderson Manufacturing Company takes a different route with their Flam-in-Go. It is made from stainless-steel in 1/4-28 and 5/16-24 nipple sizes.

The bottom section takes the place of the nipple and has a recess to hold the small pistol primer with an unrestricted hole direct to the powder. With primer in place, a cap containing a short firing pin screws down on the bottom section. When the hammer falls it hits the small firing pin and fires the primer. It has three safety features: The cap has a gas vent hole in case of a blow back; the hammer stays

on half-cock; when the cap is unscrewed one turn for carrying the gun, the primer will not fire, yet a quick turn back down and the gun is ready to fire. Even if not normally used on your gun, it is a useful device if you have a loaded gun and regular percussion caps will not fire the load. With this device and a hot pistol primer, the gun will fire if it is at all possible.

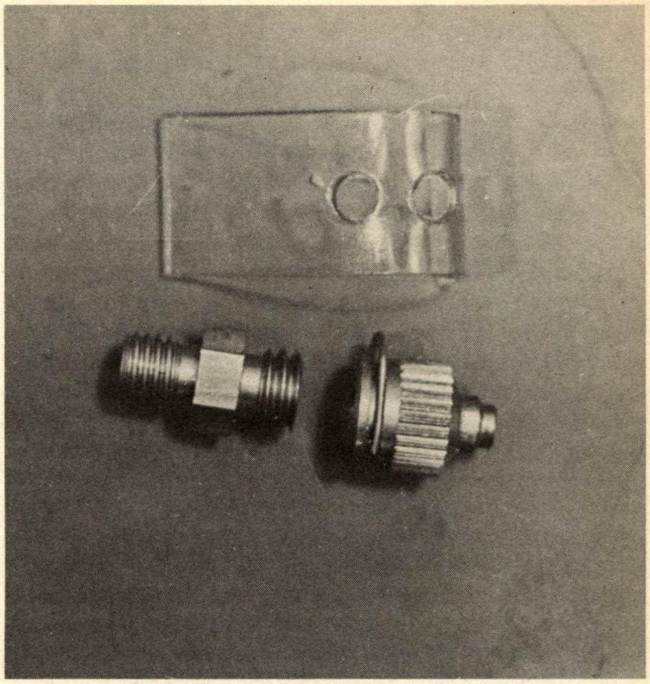
While I personally prefer traditional features on muzzleloaders, there are some modern improvements that do not alter appearance but are superior to the originals. The old steel nipples were good, but created a constant battle against rust. Michaels offers a complete line of stainless-steel nipples that solves the problem. For flintlocks, Dixie offers a stainless-steel, screw-in touch hole. The only time I would not use them is when restoring an antique that would not be fired!

Another useful item is a solid bronze nipple. No matter how careful you handle your gun, some nut will pick it up and snap it! When not in use, remove the regular nipple and install one of these. They are inexpensive, protect the regular nipple, plus the hammer, and the gun cannot be fired.

The reproduction-replica era has ushered in a large variety of old and new projectiles. They are far too numerous to even attempt to list and describe. The best advice is to study manufacturers' catalogs. The only common denominator is that they are either round patched balls or greased bullets used without a patch.

Regardless of your choice, if you want the best performance the land and groove diameter of a barrel must be measured. Remove the breech plug and push an oversized, pure-lead slug through the barrel. Measure both the land diameter and the groove diameter. Write it down! Reinstall the breech plug.

If you are using an unpatched bullet, the bullet diameter should not exceed the measured groove diameter. You may get it seated on the powder, but you will deform the pure-lead bullet and accuracy will suffer. Add powder



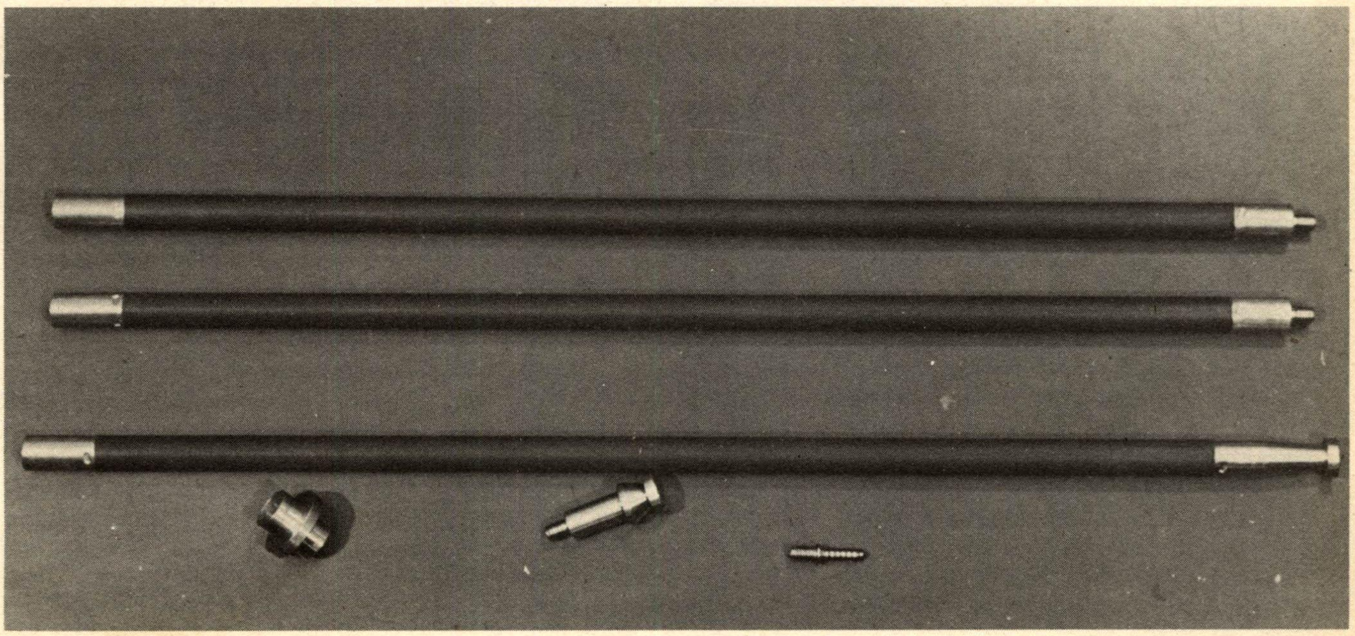
*Flam-in-Go device for small pistol primers. Left part takes place of nipple, holds primer. Screw cap, right.*

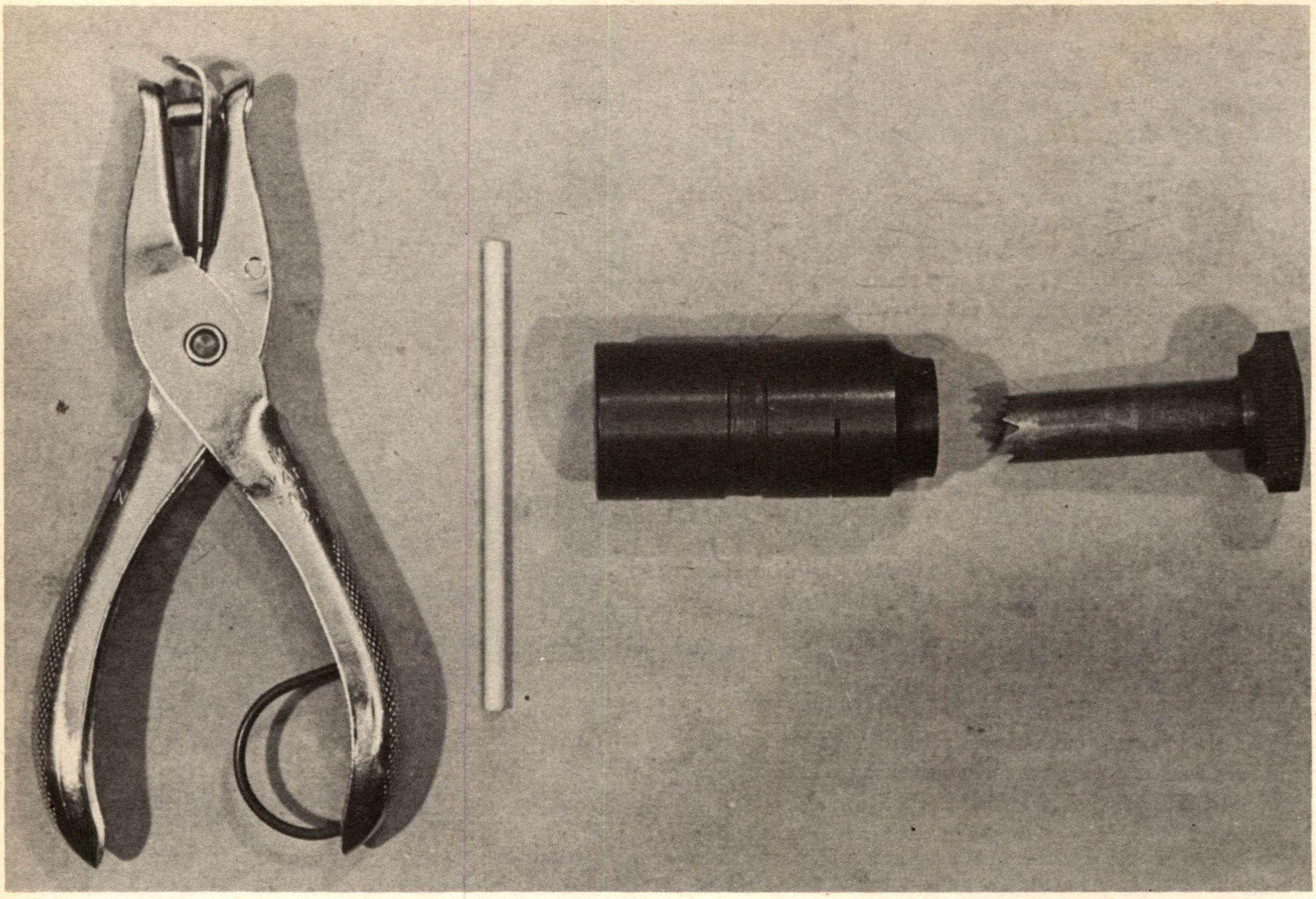
residue and there is a good chance of a bullet stuck halfway that must be pulled out. Never try to shoot it out! Always use a ball puller.

Undersized nonpatched bullets usually will not follow the rifling lands, especially on hot loads. If a choice has to be made, select an oversized bullet. Lee and several other manufacturers make a simple sizing die consisting of nothing but the die body and a punch. Select the correct-size die; grease a Mini or Maxie-type bullet and then tap it through the sizing die with a punch and mallet.

For round balls used in revolvers, the ball should match

*Three-piece wood-colored fiberglass ramrod illustrated below is from Michaels of Oregon, described in text.*





*Forster Products Tap-O-Cap is ingenious device for making percussion caps from aluminum cans and toy pistol caps. Punch removes priming discs from cap roll, small wood dowel is used for inserting discs, bottom forming die with slit to receive strip of aluminum, and a punch for forming caps from aluminum strip. See text for details.*

the barrel groove diameter. Many people recommend an oversized ball, but my personal experience indicates better accuracy with a groove-diameter ball. The percussion cap on revolvers must be snug on the nipple. To prevent chain fire – powder in other chambers igniting and firing – grease usually is placed over the balls after they are seated. It's messy, but it works.

An alternative, and better solution, is to use the waxed felt wads offered by Dixie and the Log Cabin Shop. These are placed over the powder. You can buy them pre-cut or use the kit available from the Log Cabin Shop. The kit consists of a punch and eight large sections of pre-waxed felt.

A round patched ball is the old favorite and, again, there are a multitude of ball diameters. Standard procedure is to select a ball one caliber – .01 inch – less than land diameter. Using a .01-inch-thick patch, the patch around the ball is compressed to .005-inch between ball and land for snug fit.

Pre-cut patches are fine, provided you buy both patches and balls from the manufacturer who made the gun. A loose-fitting patch loads easily and is sufficient for plinking and light loads. The tight-fitting patch is a bit harder to load, but gives top accuracy with both light and heavy hunting loads.

The best solution is to try different thicknesses of patches. When you find the best one for your specific rifle, buy a large section of cloth and cut your own patches. Forster Products makes a simple patch cutter that turns out 1¼-inch-diameter patches as fast as you can hold the base against the cloth and turn a wooden knob.

Some shooters prefer to just use a piece of cloth, press the ball in the muzzle on top of the cloth and use a patch knife to cut off the excess cloth. For those who prefer this system, fine. Just be sure the cloth is greased and you have a sharp patch knife. Spit is a poor substitute as a patch lubricant, and is a barrel-ruster supreme.

Getting back to projectiles, you can buy pre-cast balls and projectiles. I feel this is fine for a beginner or someone who does not have the time to cast their own. After shooting a muzzleloader for the initial experience, however, casting your own will increase your pleasure, usually result in better performance, and cut the shooting cost.

Lyman, Lee and several companies offer inexpensive, small lead melting pots that will fit on the kitchen stove. The next item is a lead ladle to transfer the molten lead to the mold; another inexpensive item. The third item is *Lymans Cast Bullet Handbook,* for it will answer all your questions. There are more expensive, self-heating melting pots, but start with the inexpensive basics.

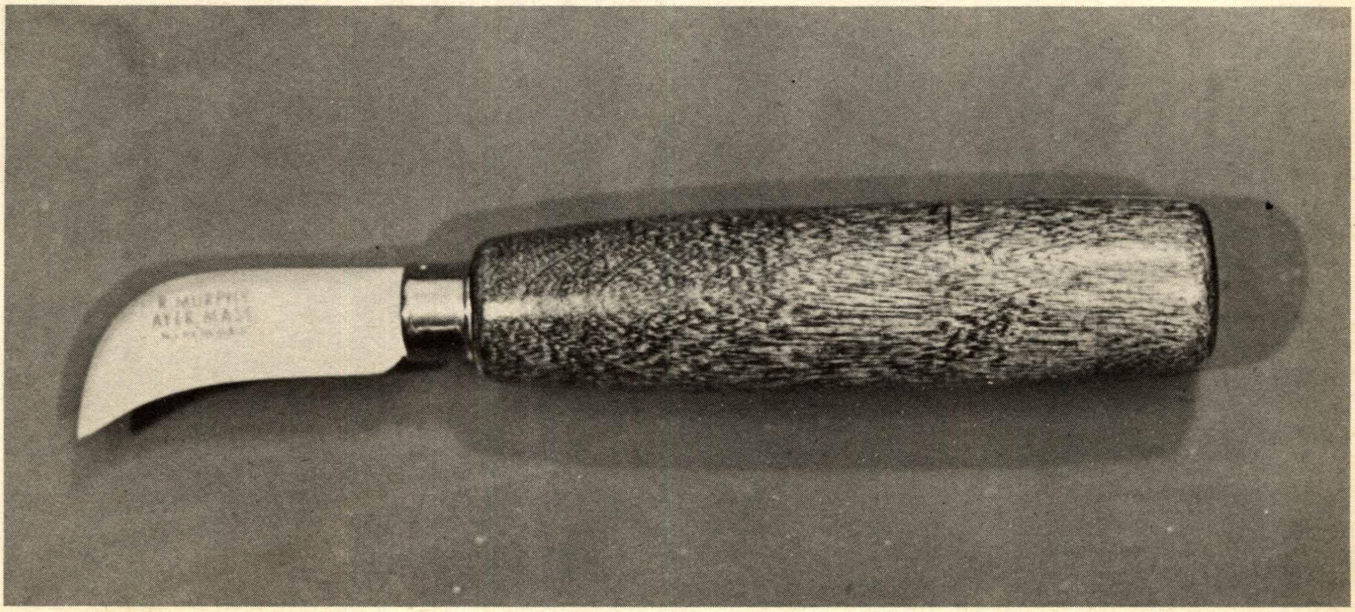
You can divide bullet molds into three general categories. First are the brass mold and handle-types copied


*Muzzleloaders kit contains wood bullet block, patch cutter, leather thong and ball starter.*

from the originals. They are inexpensive, but require thick leather gloves or a rag around the handles to protect your hand. Next are the brass or steel molds, again copied from the originals but equipped with wooden handles. Finally, you have the Lyman modern-style molds with interchangeable mold blocks and good, heavy-duty handles. Several companies offer molds similar to Lyman's with steel mold blocks. Lee molds are similar in appearance, but use fixed handles attached to aluminum mold blocks.

A wooden loading block is easy to make from any good piece of flat hardwood. Just drill the correct diameter size holes through the wood block to hold a greased, patched ball firmly. To use, place the block over the muzzle and use the ramrod to push the patched ball out of the block hole and into the bore. This works, but the long ramrod is awkward to handle. A simple and more practical addition is a ball starter. Cut a hardwood dowel, close to bore diameter, about six inches long. Next, cut off a two-inch section of an old broomhandle. Drill a hole in the end of the broomhandle to match the hardwood dowel and glue

*Inexpensive patch knife from Brownell's is made of good-quality metal and comes correctly ground.*



the dowel in place. The ball starter is used to push the patched ball out of the loading block and down the bore a short distance, then a ramrod is used to complete seating. A leather thong to connect the loading block and ball starter keeps both handy for quick use.

The short ball starter attached to the wooden loading block is an old idea and a good one. The big, heavy-barrel target rifles with false muzzles and paper-patched bullets required longer ball starters. The modern Maxie-type bullet requires a combination of the two original styles to get the unpatched ball started down the bore.

There is no shortage of makes to choose from today; just avoid those types with long wooden dowels. They are just too long for this type of bullet and break easily. The best type has a brass or aluminum rod in place of the wood dowel.

A welcomed addition is a guide bushing. This slips over the starter rod and keeps it centered as it pushes the bullet down the bore. Although primarily designed for the Maxie-type bullet, the modern ball starter can also be used with patched round balls as they compress the tight patch and make final seating with the ramrod easier.

Nipple wrenches were covered in the gunsmithing tool section. Needless to say, one should be carried in the field to match the nipple of the gun being used. A good choice is the high-strength-steel Michaels Deluxe, as it has a removable brass cap with a built-in stainless-steel nipple pick. In addition there is a storage space inside for two extra nipples, or one nipple and a few spare percussion caps!

In case of a misfire, clean the nipple hole with a nipple pick and try another percussion cap. If this fails, unscrew the nipple, drop a small amount of fresh powder in the hole, reseat the nipple carefully and try again. Ninety percent of the time this will fire the charge.

An old trick to help avoid misfires is to bump the barrel near the nipple with the heel of your hand before seating the ball, jarring the powder up into the nipple seat, then seating the ball firmly on the powder charge.

All flintlocks require not only a good flint but also correct seating of the flint in the jaws of the hammer. Most modern shooters use a piece of leather around the flint to help secure it in position and it works fine. A strip of sheet lead quite often was used in the originals, which provides a slightly better grip on the flint.

The making of flints by hand is a fascinating story in itself and has almost become a lost art. There are no exact standards. Basically, the French-style flint is light in color with one striking edge; the British flint is black and flatter with dual striking edges. The life span of a flint varies as it is a natural stone and the lock construction and quality also has a bearing. Roughly a good flint should fire from twenty to fifty shots before the edge becomes too worn.

A modern version is made from Agate, a more dense and

*Modern bullet molds are available in nearly all common calibers, such as this group in .50 cal. The Lee R.E.A.L. mold features aluminum blocks and permanent handles, while the Lyman has detachable handles, double cavity molds.*


*CVA's Deluxe Shooter's kit contains everything the shooter may need to get started, including adjustable powder measure, ball seater, CVA's 100-page "Start Muzzleloading" handbook, grease patch lube, shooting patches, caps and capper, plus the appropriate size lead balls. Kits are on the market in either .45 or .50-caliber flintlock or percussion.*

harder stone that can be sawed to precise shape. This more plentiful stone will usually give one-hundred shots or more before the edge becomes worn. There is always the question of whether the beveled or flat edge of the flint should be down. Usually the flat edge is down, and the bevel up to prevent chipping. However, some guns require the reverse position. The only correct answer is the position that produces the best shower of sparks into the pan.

Now we come to the question of what is the best type of ramrod. Rifled muskets and revolvers are eliminated; our concern is with muzzleloading rifles, pistols and shotguns. Almost without exception, the originals used hickory rods. While other dense hardwoods can be used with good success, hickory still is the best choice. Dixie Gun Works and several other firms offer hickory rods in several diameters around forty-two inches in length at less than a buck each.

Fiberglass is a modern material that makes a sturdy rod. Again, these are available from the same sources. CVA offers a solid, wood-colored fiberglass rod in .45 and .50 caliber in a three-foot length with a brass cleaning jag which unscrews and leaves a ball and patch puller on the rod. Michaels offers a three-piece, wood-colored fiberglass rod, each section twelve inches long. It has both ends tapped, one 8-32 and the other 10-32 for cleaning accessories. It comes with cleaning jag, ball puller and a brass muzzle-guard guide. Available in calibers .45, .50, .54 and .58, it can be used as the regular ramrod or disassembled for a compact spare.

Personally, I feel that a muzzleloader should have a field ramrod; the cleaning rod left at home. The black powder gunsmith will require several good cleaning rods, each made to perform a special task.

The field ramrod should be fitted with good brass tips, the tips glued and cross-pinned to the rod. While its primary purpose is to seat the ball down the barrel, ends of the ramrod should be threaded to accept cleaning equipment and a ball or patch puller. Thread size 8-32 and 10-32 are standard for both reproduction and modern cleaning attachments. A modern brass bore brush and loop-type cleaning patch attachment can be carried in the patch box and quickly fitted to the rod to remove excess powder fouling.

Sling swivels and slings were used on both military rifled muskets and many of the plains-mountain rifles. While some may disagree on the latter, I doubt whether they will question the convenience. Michaels offers a complete line, on which some replace the manufacturer's thimble and others requre drilling and tapping a thimble. They all utilize the well-known quick-detachable swivel. In addition, they also offer a rustic, suede leather sling with leather thongs for lacing the sling to the swivels.

No muzzleloader can carry his accumulation of goodies in his pocket without danger of his belt breaking and sudden drafty exposure! The shoulder bag is called everything but a purse! Possible bag, war bag and hunting bag are some of the names. During my boyhood days in the South we just called them "tote sacks." The only recommendation is a wide, adjustable shoulder strap and a flap cover over the bag.

These are just a few of the accessories and accoutrements available. The specific manufacturers mentioned are just the ones I know personally and have used. There are many others of top quality that I simply have not used. I make it a point never to recommend a product whose quality I do not have firsthand knowledge of.

The black powder gunsmith, hobbyist or professional must have a good, working knowledge of accessories and accoutrements. Like the guns, he will have to repair them, build them and offer recommendations to the black powder shooter.

CHAPTER 15

# EMF'S .44 REMINGTON PERCUSSION REVOLVER

*The EMF .44 Remington percussion revolver as received, functional and complete except for grips, grip nuts, grip screw and grip pin. Finishing work to be done.*

THIS MODEL percussion revolver has a personal appeal as my great grandfather, Enoch Riley Walker, carried one as a Confederate soldier. He enlisted in 1861, fought in the First Peninsular campaign, was wounded and returned to Alabama.

Recovering from his wounds, he joined General Nathan Bedford Forrest's command. As a first lieutenant, he was in charge of a special sniper unit, fought at the Battle of Mobile Bay, rejoined Forrest and fought in the Battle of Selma. The battle ended with the Union capture of Selma, but he escaped by swimming across the Alabama River.

He carried the same personal half-stock percussion rifle throughout the war. Somewhere along the way he picked up a new model Remington .44 and used it rather than the usual southern choice of the .36, as the same mold was used for his rifle and the Remington.

These and similar accounts, plus the fact that the Union purchased 115,563 in .44 caliber and 14,201 in .36 caliber – placing Remington percussion revolvers second only to Colt by less than 3000 revolvers – attests to its popularity. This does not include the revolvers of all makes purchased by states and individuals. There is no question that Colt is due deserved credit for its long, hard struggle to achieve public and military acceptance of the percussion revolver. However, Colt was stuck with cosmetic configuration. Remington, on the other hand, could start with a new and simpler product with full knowledge of the problems of manufacturing.

When Sam Colt's basic patents expired in 1857, Remington and other manufacturers were relatively free to begin production of their own revolvers. This is no disrespect to Remington, only good standard business practice. It is somewhat gratifying that both revolvers played an important role in the development of these two well-known companies.

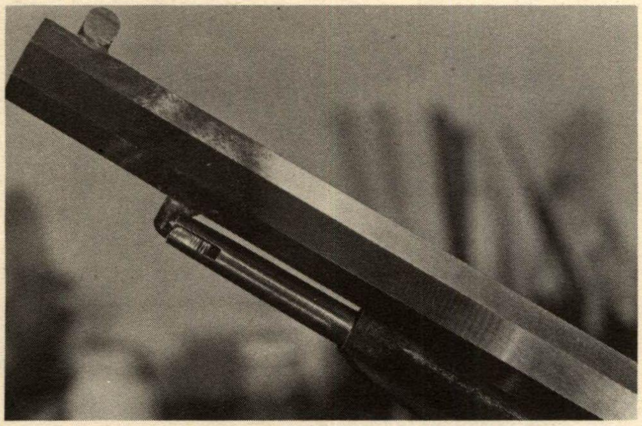
## This Steel-Frame New Model Kit Is An Excellent Reproduction Of The Original

The Remington percussion revolver is widely known as the model 1858, which is incorrect. There are, in fact, three distinct percussion revolver models. In 1858 Remington began production of a solid-frame revolver based on the "Beals Patent, September 14, 1858," and this is stamped on the barrel. Interestingly enough, Eli Whitney, Jr., originated the solid frame, and Beals was an employee of Whitney! The Beals' patent basically concerns the loading lever, which is independently hinged to the frame; when lowered, it allows the T-head cylinder pin to be pulled forward to free the cylinder for removal. This is the origin of the model 1858 designation. It was produced in .44 and .36 caliber.

The second model is stamped "patent December 17, 1861" and generally referred to as the Elliott model. William H. Elliott was a superintendent at Remington. He added the wide curved web to the loading lever for additional strength. The second feature was a cutaway section of the top of the loading lever to allow removal of

the cylinder pin without lowering the loading lever. The idea was to allow quick replacement of another loaded spare cylinder. The only problem was that recoil often pushed the cylinder pin forward, jamming the revolver.

The third and final model is the 1863; many of the 1861 model revolvers were modified to conform to the changes. Sam Remington is credited with what is generally called the



*Darkened area at barrel muzzle is from manufacturer silver soldering front sight and lever latch to barrel.*

New Army Model although the barrels were stamped "patented September 14, 1858," which probably explains the confusion. The New Model Navy is the same design, only in .36 caliber with the usual 7½-inch barrel, while the .44 Army has the standard eight-inch barrel.

The basic changes are as follows: The cone German silver front sight was replaced with a steel pin, its sides cut to form a blade. The shield is cut away at the front to expose the barrel threads. The cutaway Elliot slot in the loading lever was omitted, requiring the dropping of the loading lever to remove the cylinder pin as in the original Beals' version, but the reinforced loading lever web was retained.

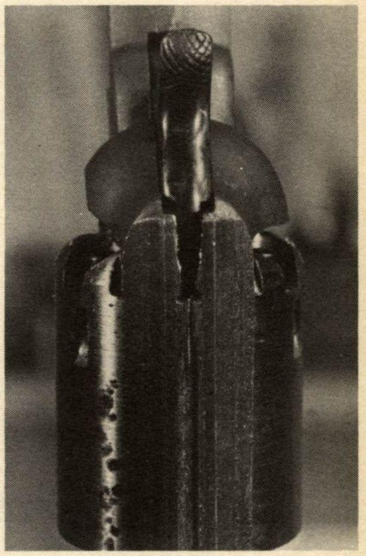
*Close-up of cylinder section of gun shows two screws securing parts as in original. Front part of brass trigger guard not fully seated and must be polished and filed with steel frame for accurate mating.*

The most important feature was the addition of notches between the chambers which the nose of the hammer rested in as a safety notch!

The one-piece frame, simplicity of internal parts and rugged dependability played an important role in the popularity of the New Model. The Smith & Wesson-owned Rollin White patents prevented a bored-through cylinder that was necessary for metallic cartridges. Remington continued production of the New Model until 1888, turning this patent liability into an asset. In order to use rimfire metallic cartridges, a new cylinder was made, cutting it off just in front of the usual percussion nipples. A separate washer-type plate was slipped over the ratchet and indexed against the rear of the cartridges.

Thus, the New Model could fire metallic rimfire cartridges and use the cylinder pin to punch out the empties. As the original percussion loading lever was

*Hammer down top view shows hammer notch which must be filed to shape according to instructions.*

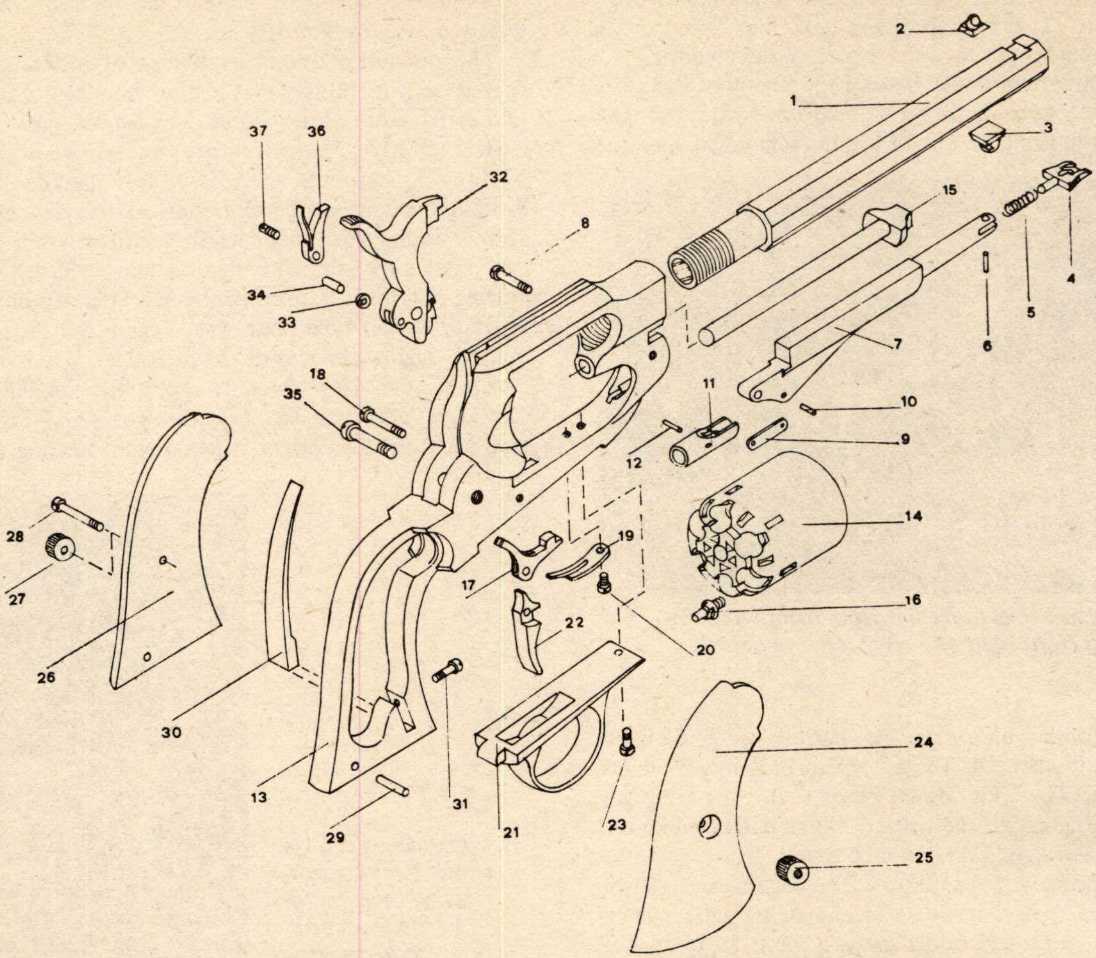


retained, a regular percussion cylinder could be used without any alteration. In the remote areas where metallic cartridges were scarce, this transition version extended the life of the New Model far in excess of its counterparts.

Early and Modern Firearms Company, better known as EMF, is a major distributor of reproduction and replica black powder guns. Although their inventory contains a wide variety of all types of blackpowder guns, their Remington selection is almost without equal. In kit form they offer the Remington New Model in both brass frame and steel frame, plus a wide selection of matching accessories.

Their steel-frame New Model is an excellent reproduction down to the smallest detail. Although their detailed instructions cover every phase of assembly from a pile of parts, the revolver kit arrived assembled and fully functional except for the grips, grip nuts, grip screw and grip pin. My first impression was all that remained was to fit the grips, polish the metal and start applying the finish; but I was wrong!

Any percussion revolver has many of the features of a modern cartridge revolver. As such, it has many more parts and components that not only must function, but also function at the correct time in the action cycle. The number-one rule in assembling any percussion revolver is




## REMINGTON PERCUSSION REVOLVER — PARTS LIST

### USE BLACK POWDER ONLY

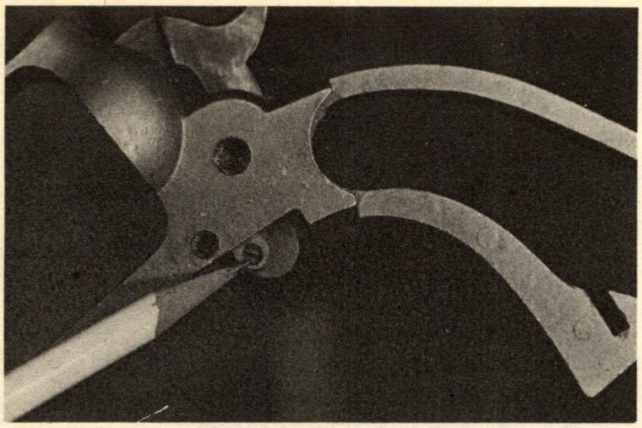
1. BARREL
2. FRONT SIGHT
3. LOADING LEVER RETAINER
4. LOADING LEVER LATCH
5. LATCH SPRING
6. LATCH PIN
7. LOADING LEVER
8. LOADING LEVER SCREW
9. LINK
10. LINK PIN
11. RAMMER
12. REAR RAMMER PIN
13. FRAME
14. CYLINDER
15. CYLINDER PIN
16. NIPPLE
17. CYLINDER BOLT
18. CYLINDER BOLT SCREW
19. TRIGGER & BOLT SPRING
20. TRIGGER & BOLT SPRING SCREW
21. TRIGGER GUARD
22. TRIGGER
23. TRIGGER GUARD SCREW
24. RIGHT GRIP
25. RIGHT GRIP NUT
26. LEFT GRIP
27. LEFT GRIP NUT
28. GRIP SCREW
29. GRIP PIN
30. MAINSPRING
31. MAINSPRING SCREW
32. HAMMER
33. HAMMER ROLLER
34. HAMMER ROLLER PIN
35. HAMMER SCREW
36. HAND & SPRING
37. HAND PIVOT

not to automatically assume any part is correctly fitted and timed to function correctly in its proper sequence!

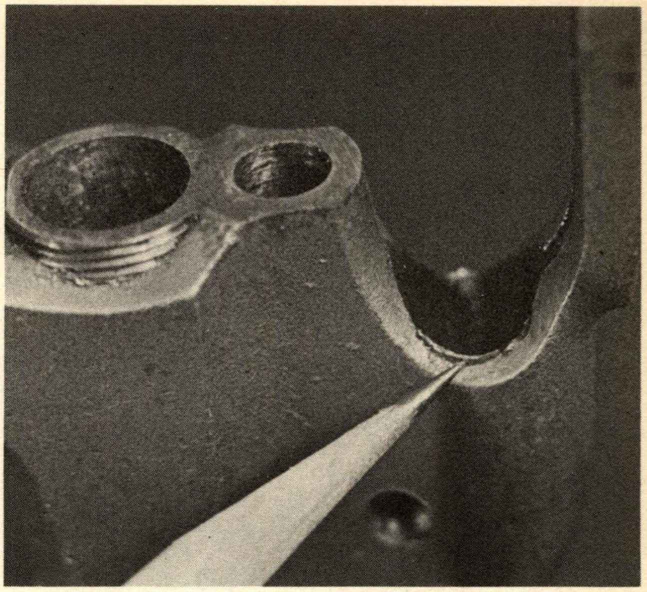
Secondly, I have yet to see any production handgun, modern or reproduction, that cannot be improved by careful hand-fitting of the parts and components. Correctly done, the finished product will be far superior in function and performance to a finished production model. If this were not true, then pistolsmiths would not exist.

The Remington New Model has fewer parts than any other percussion revolver, which is an asset in learning both construction and servicing. In today's growing black powder market, target shooting is an important factor. Almost invariably the serious shooter uses a reproduction Remington New Model, often fitted with modern adjustable sights.

The EMF instruction sheet and parts diagram should be thoroughly read and studied; the information will prove invaluable in understanding how each part functions with



*As described in text, trick to disassembling revolver is to press hammer down until hand screw is visible, (pencil point, above). Hand and spring are removed down, and hammer is pulled out and up. Burrs left from machining, right, are removed by needle filing.*



other parts and components. As it is written for total assembly, it contains details that are critical to correct any potential malfunctions.

When you have read the instructions thoroughly and fully understand them, pick up the gun and examine it closely. Use the parts diagram to identify all visible parts. The part name virtually identifies its location on the gun and its function. Remember that a revolver is simply a machine or mechanical mechanism. As such, its correct function depends on a definite cycle sequence, parts and components functioning in a pre-determined sequence of movement.

Anything that retards, disrupts or prevents the cycle sequence will result in a malfunction or, at the least, prevent correct function. In gunsmithing the cycle sequence is called "timing."

To the beginner, timing may seem very complicated. In reality it is just a matter of identifying each part, knowing its function, and where in the cycle sequence its function occurs. You could write a book trying to explain timing, but the best teacher is practical experience and observation.

With your finger off the trigger, very slowly pull the hammer back with your thumb. Very slow cycling of the action allows you to feel the parts working, see the parts working, and actually hear them working. You are using three of your normal senses, sight, feeling and hearing. With practice you can quite often locate a malfunctioning gun part or component without disassembly!

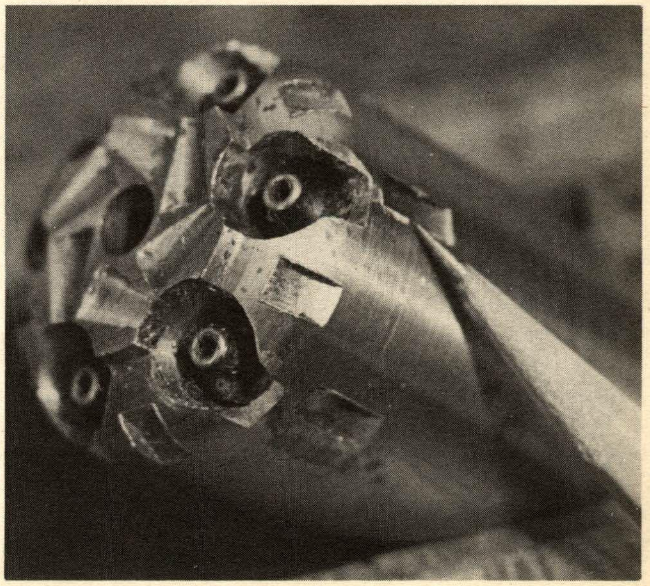
The whole trick is slow operation. You can both feel and hear parts binding due to rough surfaces. When the hammer is all the way to the rear, hold it with your thumb just enough to prevent snapping, but allowing the hammer to function normally. Very slowly apply pressure on the trigger. You can feel the sear disengage from its notch and easily judge the smoothness. Allow the hammer to ease down slowly. Again, you can feel the smoothness or any binding.

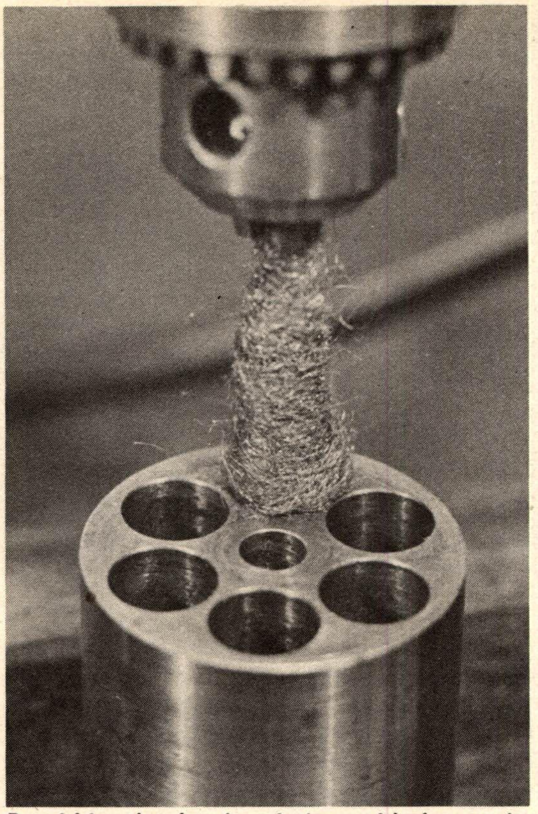
Repeat this procedure on each chamber. This slow cycling will teach you a lot. Now rapid cycle each chamber. Quite often a revolver will function perfectly on slow cycle only to jam or show a defect in rapid cycle. There are just two rules: First, never snap the gun or you will damage the nipples; second, never spin the cylinder a la movie and television, for this is both useless and wears the parts.

On the Remington New Model, remember the safety notch in the cylinder between each chamber. Pull the hammer back slightly and try the fit of the hammer nose in each of these notches. With the hammer in a notch, fully down, the cylinder should not turn by hand pressure. If it does, the notch is not cut correctly and will have to be reworked later.

Finally, check the loading lever assembly. The latch should be a good solid fit in the notch of the latch retainer. Pull back on the latch, noting the spring tension and pull the loading lever down slowly. Watch for binding at any point. With the hammer down on a nipple, note the alignment of the rammer with the bottom chamber. Check each chamber this way to be sure the rammer enters each

*Burrs left on cylinder bolt notches must be lightly and carefully removed without enlarging notch sizes.*





*Burnishing the chambers is done with short stub of cleaning rod in electric drill chuck, a pistol bore brush with four-aught steel wool wrapped around it.*

without binding or jamming. Return the loading lever to its carry position.

All of these functional inspections serve an important purpose. They indicate rough spots in the normal functioning of the revolver that will require correcting. Add to these all of the visual rough spots and you have a good idea of what and where the gun must be adjusted or smoothed for good performance. It is always a good idea to take notes as you make your inspection. Your ultimate goal is not only a revolver that looks good, but also one that functions smoothly.

As the kit comes with the grips and their components not installed, disassembly begins with removal of the cylinder. Pull back on the loading lever latch and swing the loading lever down, but do not allow the rammer to enter a chamber. Pull the cylinder pin forward until it is clear of the cylinder. The cylinder can now be removed from the right side by slightly pulling back on the hammer. Never attempt to remove or install the cylinder from the left side! Next remove the loading lever screw from the frame. Now pull the loading lever assembly toward the muzzle and out of the frame. It is best to leave these assemblies together at this point.

Remove the mainspring screw, relieving the tension on the mainspring. Be sure the hammer is fully forward. Carefully tap the mainspring out of its seat in the bottom of the grip-housing of the frame. Remove the trigger guard screw and pull down on the front of the trigger guard, ease the trigger guard out of the bottom of the frame. Next remove the trigger and bolt spring screw. Remove the trigger and bolt spring, taking care not to bend the arms. Remove the cylinder bolt screw. The trigger and cylinder bolt will now slip out the bottom of the frame.

The next phase may sound complicated, but is simple if done in correct order. Remove the hammer screw from the frame. Push the hammer down in the frame until the bottom of the hammer, hand and spring, and hand pivot are visible through the trigger guard recess in the frame. Remove the hand pivot. Now slip the hand and spring out the bottom through the trigger guard recess. Next pull the hammer up and out of the top of the frame.

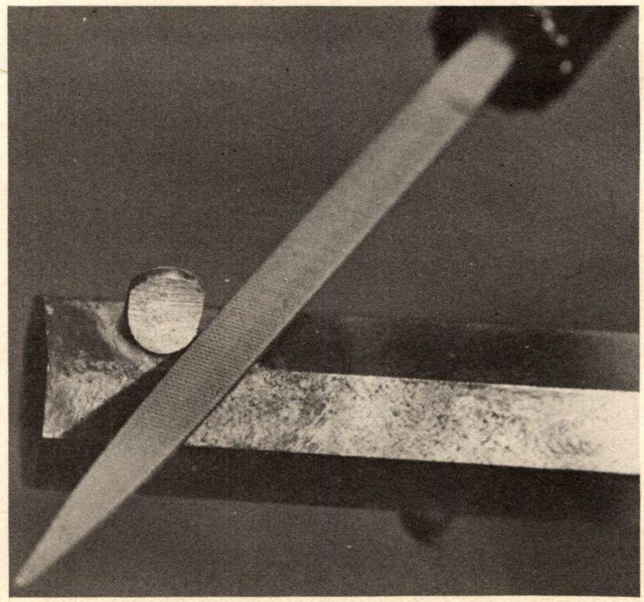
The basic disassembly is complete. After disassembly and reassembly a few times, you can accomplish the procedure in a few minutes. Assembly is in exact reverse sequence.

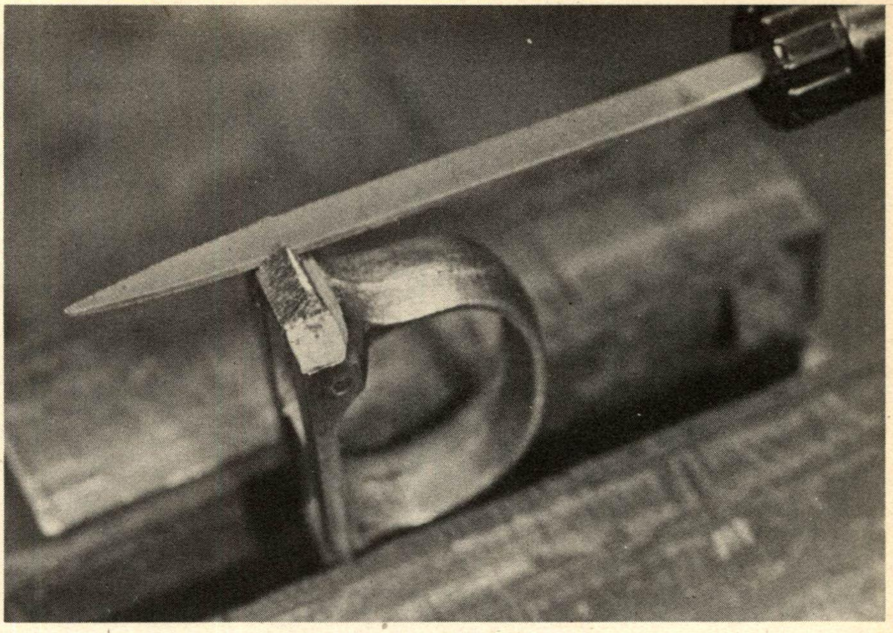
The kit has been assembled and checked for function before you receive it, with the exception of the grips. While it could actually be fired in kit state, it is by no means a completed gun. The cosmetic requirements of metal polishing and finishing, plus fitting of the grips are obvious. If only the latter is done, the end results will be a rough but functional revolver.

If, on the other hand, we go over every single piece and component with careful attention to detail, the end results will be a customized fine-tuned revolver. It will actually be superior to a factory finished version; not because the factory is not capable, but because they cannot devote the time-consuming and expensive hand labor! Many of the steps in hand tuning will appear nit-picking, but it is this attention to tiny details that adds up to a custom-tuned gun!

You can start almost anywhere, but I prefer to start with the cylinder since it is the heart of any revolver. Very closely examine the entire cylinder. Note the machining cuts, especially the edges of these cuts. Without exception you will find a rough, burred edge. When we start to work

*Flat needle file is used to remove excess silver solder around front sight. Silver solder will not blue.*





*Brass trigger guard is filed with needle file to fit and hook correctly into steel frame recess. Both sides must be exactly even.*

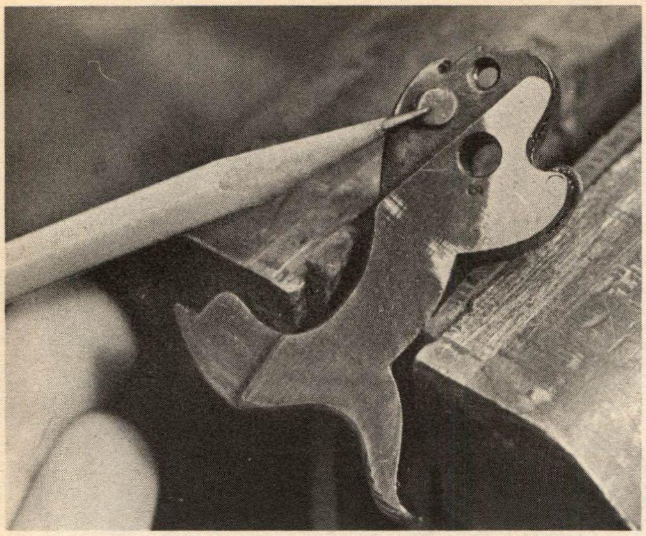
on the cylinder, each of these burred edges will be smoothed. In doing so, the original angles of the machining cuts must not be changed, enlarged or otherwise altered! The entire purpose is to remove burrs that cause friction or binding as the machining cuts allow parts to enter in the timing cycle.

The first step is to remove the percussion nipples from the cylinder. You must have a nipple wrench that fits the nipples. It should be a snug fit without a sloppy side-to-side play or the nipples will be damaged. Select two short sections of brass rods that will just enter the chambers. Place them in a vise with about one inch extending above the vise, and space them apart so that they will fit into two opposing chambers of the cylinder. Slip the cylinder over the rods. This forms an internal wrench to hold the cylinder steady as you use the nipple wrench.

After checking the fit, remove the cylinder and put a drop of penetrating oil in each chamber from the front. Allow it to soak in for a moment, then add a drop around each nipple. Place the cylinder back on the two brass rods and press the nipple wrench down over the nipple. Press down, at the same time giving the nipple wrench a quick snap and twist counter-clockwise. This should free the nipple from its seat. If not, tap the rear of the wrench with a plastic hammer to jar the seating and then try again. This usually does the trick. If not, soak the nipple in Brownell's Tap Magic, an ultra-thin solution that will penetrate the smallest opening. Then repeat the removal steps.

When a nipple loosens, turn it out about a half turn, then back in a half turn, then repeat. This loosening and tightening step burnishes the threads of both the nipple and the threaded hole. It removes tiny burrs on the threads and makes the threads mate for a perfect fit. The nipple will then screw in or out easily without binding, yet the thread fit will not be sloppy. Clean each nipple thoroughly, being sure the nipple hole is clear of grease or other residue.

*Square Arkansas stone is used on roughened hammer surface. Hammer is case hardened and will not file.*



*Care must be exercised to not alter stud protruding from hammer at pencil point. Stud activates bolt stop in action.*

Next chuck the front ends of a cleaning rod in your electric hand drill and install a .38 caliber brass bore brush. Wrap a small amount of four aught steel wool around the brush. With the drill turning, run the steel wool-wrapped bore brush back and forth several times in each chamber. This does not enlarge the chamber; the steel wool only burnishes the chamber, removing tiny burrs and any residue, leaving a bright shiny chamber.

The chamber edges are sharp and should be very lightly beveled to aid in seating the projectile. The simple way to do this is to use a piece of aluminum oxide cloth, with your thumb applying the pressure. Press down with your thumb and rotate the cylinder. Your thumb will compress and the aluminum oxide cloth will lightly and evenly bevel the chamber edge. Repeat on each chamber.

Use a piece of aluminum oxide cloth and your thumb to also lightly bevel and round the front edge of the cylinder. You want to just lightly round that sharp edge. Do not polish the cylinder pin hole! This must be a very close fit on the cylinder pin.

On the back of the cylinder use needle files and Arkansas stones to remove the extruded burrs on the machining cuts. Remove only the burrs! Do not bevel or change any edge. It is extremely important that the lines of these cuts remain original in shape and dimensions. Even when polishing the cylinder for metal finishing preparation, be careful not to dish out or alter these cuts.

When you have gone over the cylinder thoroughly, recheck to be sure no burrs have been missed. Reinstall the percussion nipples. This phase has been strictly a clean-up operation. It may be necessary later to make final corrections, but for now apply a light protective coat of oil and set the cylinder aside.

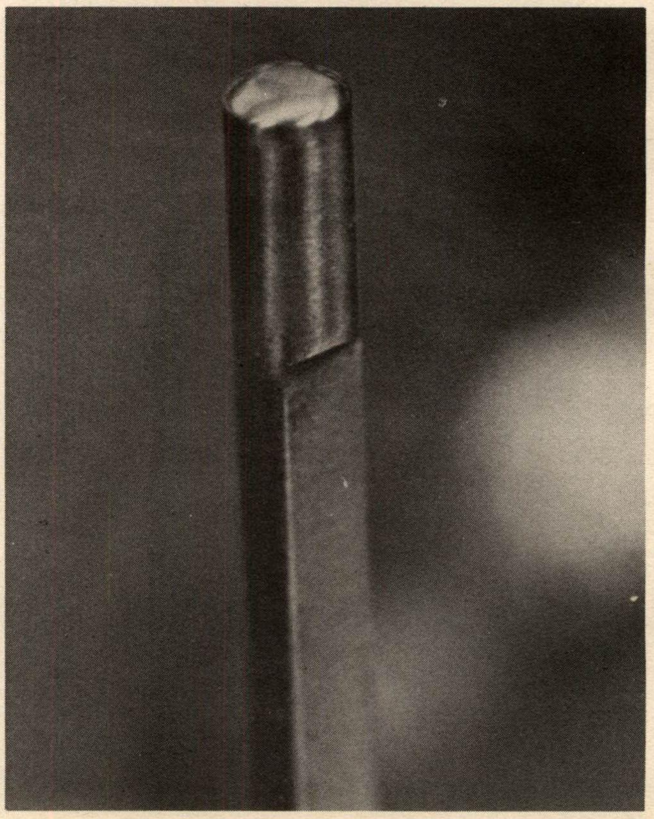
The frame, and attached barrel, is the next major component to receive the clean-up treatment. At this phase the purpose is not to prepare the metal for finishing, instead it is to remove machining burrs while retaining original lines. The most common mistake in kit building is trying to accomplish everything in one pass. The initial step, regardless of type of kit, is always correct gun function!

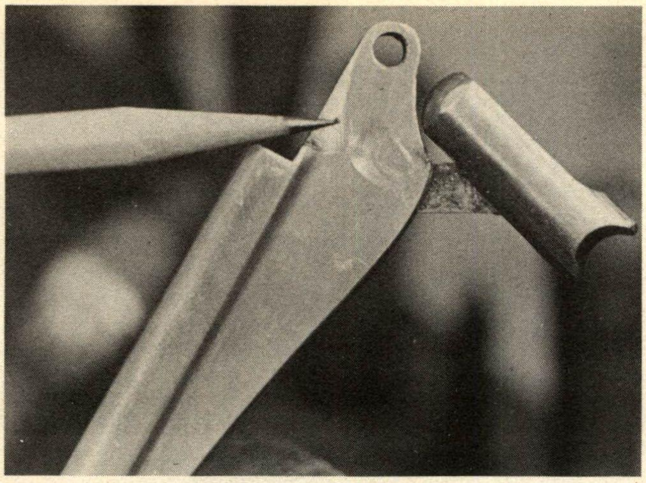
The EMF kit is of excellent quality and rightfully deserves your best and patient careful attention to every detail. Start at the rear tip of the pistol grip. Go over every edge slowly, checking for any machining burrs. Use needle files and stones to remove every one until the edges are clean. The metal later will be polished to a smooth finish. What many beginners never realize is that metal polishing is an art in itself. The most difficult part is retaining the original lines. Fully fifty percent of the guns polished and blued in commercial shops look like the polishing was done with a Number two brick; original lines are rounded off, screw holes dished out and the gun becomes a blued gob of metal! This is why the removal of burred edges in a kit is so important. It establishes and maintains the original lines of the gun.

With the grip area completed, move up to the hammer recess and do your job with the needle files and stones. Skip the outside top of the frame over the cylinder; we will come back to this spot. Also skip the trigger guard recess, as the brass trigger guard has to be fitted closer to the frame. Move up to the loading lever and rammer recess cuts. On this specific kit this area was heavily burred and required considerable work. Do not enlarge the rammer hole or loading link recess, just clean up the burrs.

Go over the entire front of the frame, removing the burrs and smoothing the surface edges. Do not touch the rear of the barrel or the frame just under the barrel. This

*As explained in text, rear end of cylinder pin is rounded and beveled to match original Remington.*





*Burr inside hammer cut produced rub marks on loading lever as indicated at pencil point.*

area controls the back-and-forth movement of the cylinder and must be a close fit. Move out on the barrel to the sight and loading lever retainer. These two parts are silver soldered to the barrel and you will find a residue that looks like glass. This is melted silver solder flux and will chip away with just mild pressure. Clean up this area thoroughly.

The next phase after cleaning and removal of burrs is to smooth up the internal parts and make any required fitting. During the initial cycling of the revolver, I had noted that the loading lever was stiff and did not fully engage the front retainer notch.

Examining the rear of the loading lever assembly, I spotted a rubbed mark on the side of the lever where it joined the rammer. Using a hard, square Arkansas stone I stoned the rough spot on the rear of the lever. The opposite side was clean. Under a strong light, a rough spot inside the machining cut of the rammer was visible. With a needle file and strip of aluminum oxide cloth, the spot was cleaned up. While the link can be removed by driving out the two pins, I would not recommend it unless absolutely necessary. Next the loading lever was cleaned in mineral spirits to remove the heavy packing grease and then lightly lubricated. A check of the fit of the loading lever screw through its hole in the loading lever revealed no problem. I reassembled the cylinder pin, loading lever assembly, and screw. All the rough operation was gone.

Using a magnifying glass to examine the fit of the loading lever latch and retainer, a few burrs were found and removed. The fit was much closer, but not close enough. The flat of the loading lever on top was hitting the bottom of the barrel. I marked the section of the lever touching the barrel with a felt-tip pen. A small amount of draw-filing was followed by polishing with aluminum oxide cloth, and on the first try the latch went into the retainer notch perfectly.

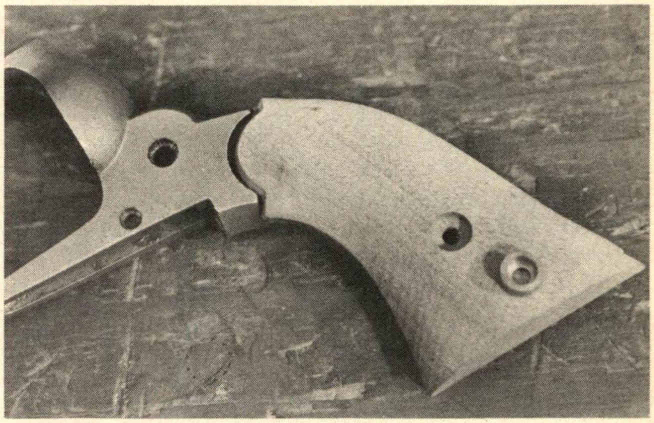
With the loading lever assembly removed, I examined the cylinder pin and its holes at the front and rear of the frame. A little light stoning of the pin front flat and its notch in the frame solved this part of the problem. On the original Remingtons the rear end of the cylinder pin was beveled, on the kit the end was flat. I beveled and polished the pin end. Next I very lightly beveled just the edge of its hole at the frame rear. The pin slipped in and out with just thumb pressure. Perfect!

As a double check I assembled the loading lever assembly and the cylinder. Again, a perfect firm fit. A note of caution: Do not polish the outside of the cylinder pin surface or its hole through the cylinder. Even if it is a wee bit tight, leave it alone as operation of the cylinder will eliminate this tightness. If polished, the cylinder will be a sloppy fit and require major correction.

The brass trigger guard was assembled when the kit was received, but was not fitted down snugly with the frame. Its recess in the frame was first cleaned of all burrs and rough spots. Next, the interior of the brass trigger guard received the same treatment. When tried in place, the fit was better but still had the gap. The rear required smoothing of both the trigger guard and the frame. The next try was better, but the front end of the trigger guard was too long and required shortening. This came down perfectly. Remember to install the trigger guard screw on each trial as its position cannot be changed.

The brass casting was then cleaned up and polished, except where it joined the steel frame. This is best done when you polish the frame so that the two pieces will be flush without any beveled edges.

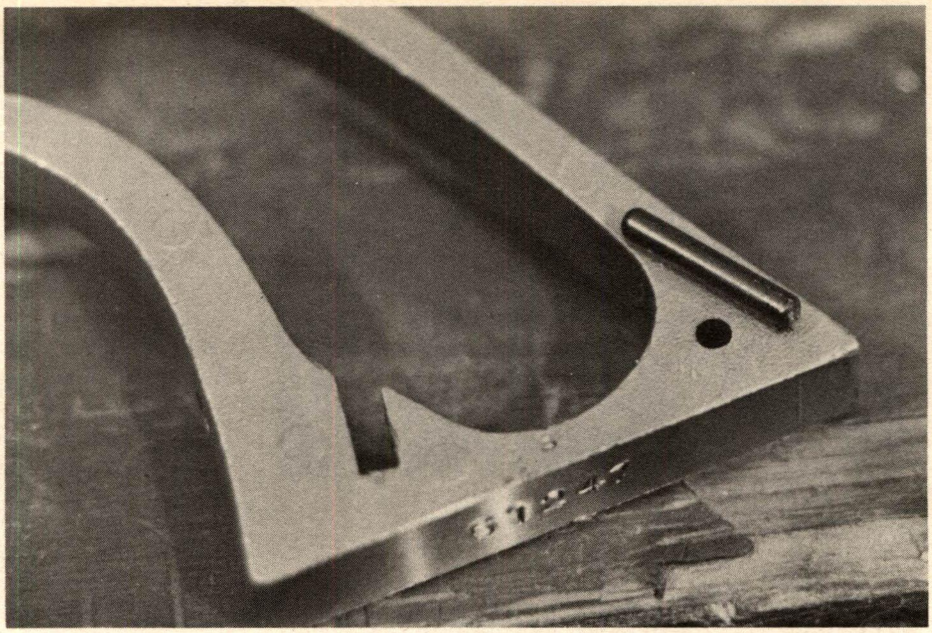
Now, using a strong light, examine the inside of the



*After inletting, excess wood will be removed from wood grip. Grip brass washer has not been pressed into inletted recess. Grip screw head is on left side of grip as per original Remington revolver.*

frame where the parts fit and function. Use needle files to remove any burrs and excessive rough spots. Go slowly! All you want to accomplish is to clean any rough spots that will bind the parts. You can examine the parts closely and a rough spot on them will help locate the offending spot inside the frame. Remove all heavy packing grease, oil and other matter that has accumulated.

The hammer is the next item and it, too, should be closely examined with a magnifying glass and strong light. On this kit, the left side had several rough marks that were smoothed with a square Arkansas stone. The place in the frame that caused these marks had been cleaned and smoothed. Note that the right side has a small, beveled stud close to the sear notches. This is the cylinder bolt stop cam and should not be touched. The sear notches were good, but I smoothed them with stones. I do not recommend this step unless you know how to do the job correctly. Have a



*Grip pin is shown loose near its pre-drilled hole in frame. Pin is pressed through frame with equal protrusion on each side.*

competent gunsmith do this step if there is any doubt in your ability! Check the fit of the hammer screw through its hole in the hammer. It must be snug but operate smoothly. Again, if it is just a wee bit rough, leave it alone as it will work its way smoother as the hammer is operated. Check the hammer roller. On this kit it was rough until I cleaned the hammer in mineral spirits and lightly lubricated in its pin. After that it functioned freely.

The hand and spring were in good shape but with a rough front. A round Arkansas stone solved this with just a few polishing strokes. Do not try to smooth the tip end! This dimension is critical as it turns the cylinder. Do not try to remove the attached spring!

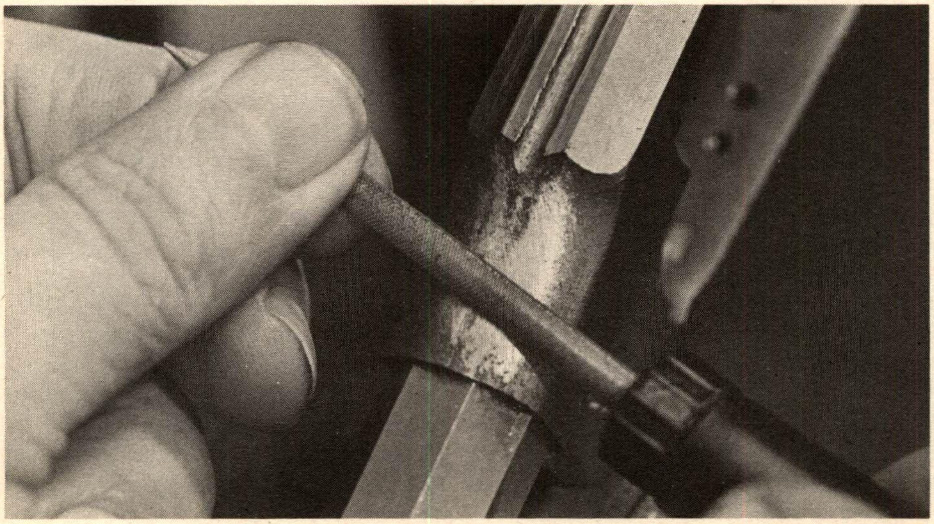
The cylinder bolt has a stud on the front that passes through the frame and engages the cylinder notches to hold the cylinder in line as the gun is fired. Under no circumstances change the width of this stud! Check its fit in the cylinder notches. It should enter easily and snugly. If not, have a gunsmith make the correction and watch what steps he takes. This is a critical point! The gun comes from EMF in functional condition, and any smoothing of this requires experience. It cannot be explained in words. However, if you watch a knowledgeable gunsmith or have him guide you, it is easy.

The trigger was correct and already blued. I checked its fit, and the cylinder bolt on the cylinder bolt screw, and they functioned smoothly with light lubrication.

Next, I completely reassembled the revolver. Cycling the action, the difference was remarkable! All of those little nit-picking steps had paid off; even a beginner could tell the change in the ease of operation. Disassembling the gun, I checked every part and component for scuff marks. Only two were found that required a light stoning.

The grips are best fitted with the gun disassembled. The first step is to examine the two grip screw nuts. The left one accepts the head of the grip screw. The right one is pre-threaded and has two small flanges on the outside to prevent it from turning when seated in the right grip nut recess. Install the two nuts in the grips on their correct sides.

Note that the top grip recess in the steel frame is beveled inward. Clean out any burrs and coat this recess with a thin



*Due to the many curves and angles of the Remington replica, needle files are used for most of frame shaping and filing. Later, aluminum oxide cloth is used.*

layer of inletting black. Press the grip upward and forward so that the inletting black can make its mark on the wood. Be sure to keep the grips straight as you push. It is then a matter of cutting and filing the spots on the wood marked by the inletting black.

Work first on the left grip and then the right, inletting and fitting them as a pair. Try the grip screw several times to assure that the inletting is correct. When they are finally seated, there will be a small amount of wood overhang all around. This will be removed as you file and polish the metal.

With both grips in their correct positions, carefully remove the left grip without disturbing the position of the right grip. Select the correct diameter drill and slip it through the grip pin hole at the bottom of the frame. Twirl it in your finger tips to mark the right grip. Now repeat on the left grip. Install the grip pin through its hole in the frame with equal protrusion on each side.

Chuck the drill bit in a hand-operated drill. Measure the amount the pin protrudes from the frame and mark the drill with a felt-tip pin a wee bit more. Now drill exactly this depth on the spot you marked on each grip. Keep the hole straight. The grips should now go back into place with the grip pin entering each hole and the grip screw securing the grips.

It is now time to prepare the metal for finishing. Reinstall the brass trigger guard but leave all other parts off the gun. While the Dremel Moto-Tool can be used in final polishing, it is best to do as much metal preparation as possible with files. There are a lot of rounded surfaces to be finished, and a set of needle files will allow full control in retaining the original lines. Go slowly and do a good, careful job.

The notch in the frame where the hammer nose enters was jagged on this specific kit. Clean this up with needle files. The notch should be a clean, straight rectangle. Use the widest part of the notch as your width guide, and the front longest edge as your end guide. Do not cut the rear sight slot deeper or lower than the height of the front sight.

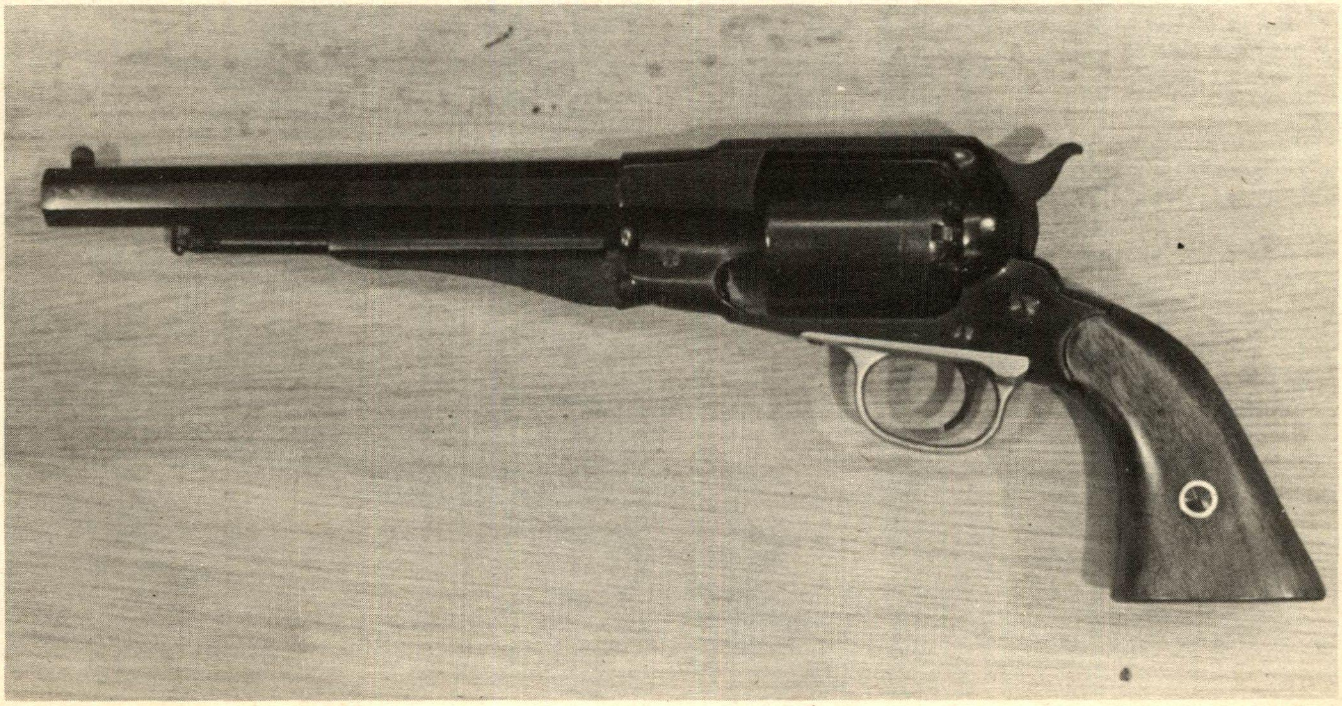
When you have finished, clean all surfaces of file shavings and dust. Clean the bore and each chamber. Reassemble the gun, applying a little lubrication on the internal parts. Make the percussion caps only, no load, function-test fire.

Now out to the range. Test with light loads and then up to a full charge in each chamber. If your full charge load is grouping low, file a small amount off the front sight. If the group is high, deepen the rear sight notch with a needle file.

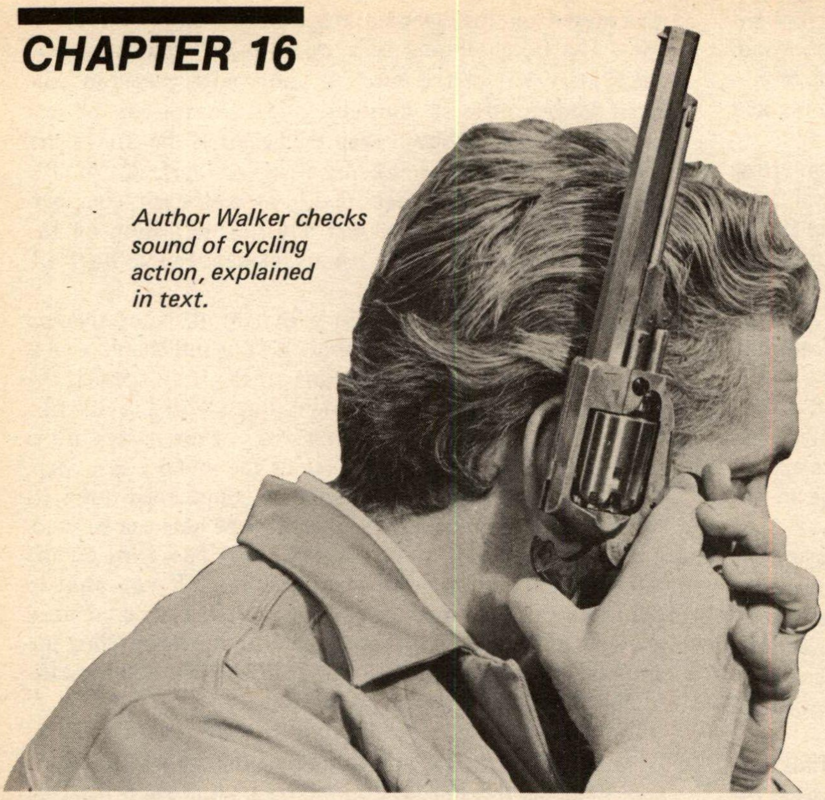
Clean the revolver thoroughly and you are ready for the final finish. On the original versions the metal was a deep, rich blue. I would recommend that commercial hot salts blue be used for best results. The kit-type blue can be used, but is difficult due to the many parts. The grips on the military Remingtons were plain oil finish. If you want to duplicate this, use pure, boiled linseed oil. The commercial grips were lacquered. If you wish to duplicate this, use Tru-oil, G-96 or Linspeed finish. For this kit I used hot salts bluing and the military oil grip finish.

Some of the commercial models were plated and had ivory or pearl grips. If you choose plating, be sure to have a gun shop do the job. The common plating shop uses the wrong type of plating, and too much. While I finished this kit as the average person would, I have other plans. The gun will be plated and a set of grips made from stag horn blanks, which are available from Brownells. The advantage of plating is ease of cleaning and rust prevention. The kit turned out so well that it will become a part of my personal gun collection.

*Completed EMF .44 Remington New Model Army Revolver, commercially hot blued with linseed oil finished grips, as was original military version of gun. For beginner or expert, kit provides excellent shooting or display gun.*



CHAPTER 16



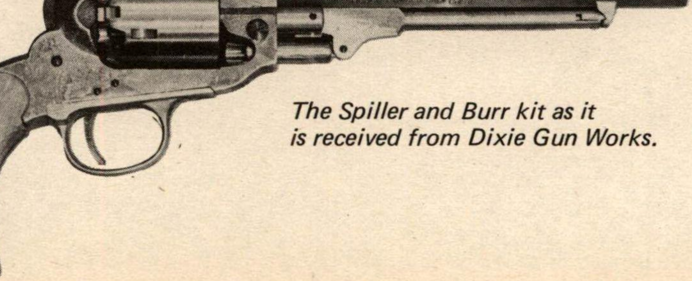
Author Walker checks sound of cycling action, explained in text.

This Kit In .36 Caliber Closely Follows The Original And Comes Assembled And Functional

# DIXIE GUN WORKS' SPILLER AND BURR

IT IS ESTIMATED that during the "War to Establish the Southern Confederacy," commonly called the Civil War by the northern tribe, approximately 7500 percussion revolvers were produced in the South. Most were variations of the Colt, and the solid-frame Spiller and Burr accounted for slightly over 1450 of this production.

It is interesting that the most technically advanced Confederate percussion revolver, the Spiller and Burr, and the most technically advanced Union percussion revolver, the Remington New Model, have a common ancestor. The solid frame was developed by Eli Whitney, and the loading



The Spiller and Burr kit as it is received from Dixie Gun Works.


*Disassembled, except for loading lever assembly, the Spiller and Burr is ready for smoothing and finishing.*

lever and rammer joined to the frame were developed by Fordyce Beals while employed by Whitney.

The Whitney revolver, while incorporating both of these features, never attained the military acceptance as did its offspring. Only 11,214 were purchased by the Union during the war. This does not take into account the thousands purchased by independent militia units nor the individual purchases. In fact, the total Whitney production indicates wide acceptance by the general public.

As the Whitney revolvers were developed and produced prior to the war, a large number found their way southward through the civilian market. Several, with full documentation, are known to have served the Confederate cause from the beginning of the war. The same is true of individually owned Union service Whitneys.

Perhaps the only reason the solid-frame revolvers – with obviously easier production capabilities – were not utilized more by both sides is due to the popularity of the Colt. While Colt was not the first revolver, it was the first revolver to gain public acceptance. Even today a proven product will hold its place while a more modern product goes down the tube simply due to lack of public acceptance.

Of all the Confederate revolvers, only two used the Whitney solid-frame construction: the T.W. Cofer of Portsmith, Virginia, with less than 140 produced; and the Spiller and Burr. All the rest were variations of the Colt.

Although designated the Spiller and Burr, the company consisted of three people. Edward N. Spiller, a former Baltimore, Maryland, merchant, handled the financial aspects of the company. David J. Burr owned a machine company under his name in Richmond, Virginia. The silent but guiding partner was James Henry Burton of Virginia. At the beginning of the war, they formed a partnership to manufacture arms for the state of Virginia.

In June of 1861 Burton was commissioned a lieutenant colonel in the Virginia militia and named chief of ordnance for the state. Then in December he was commissioned a colonel in the Confederate Army with primary duties as an aid to General Gorgas, chief of ordnance. Throughout the war Burton played an important role in the production of all Confederate arms.

At the time of his commissioning Burton offered to produce revolvers for the Confederacy; his connection with the Spiller and Burr Company was well known. A contract to deliver 15,000 revolvers was negotiated and the company received a $100,000 loan from the Confederacy to purchase additional equipment. The firm then was moved into the old S.C. Robinson carbine factory in Richmond.

There is some question as to what was actually produced at Richmond, as the plant was moved to Atlanta, Georgia, during the spring and early summer of 1862. It is known, however, that one or two Spiller and Burr prototypes were produced; one of which still exists in a private collection. The existing prototype is totally unmarked, has fancy wood grips and several small differences in detail from the standard version.

The Atlanta plant was slow in getting started,

Confederate records indicating only a delivery of six hundred revolvers in February of 1863; this is somewhat confusing, as 762 revolvers are known to have been produced in the Atlanta plant.

Due to the slow delivery and conditions of the loan, the Confederacy purchased the company and all of its equipment in February of 1864, moving operations to the Confederate Arsenal in Macon, Georgia. Perhaps the other 162 revolvers were produced between the February 1863 delivery and the February 1864 move to Macon.

It was not until October of 1864 that production resumed at the Macon arsenal. Existing Confederate records indicate a total of 689 revolvers were produced at the arsenal. As with all Confederate firearms, several odd but well-documented variations exist.

In essence, the Spiller and Burr is a copy of the Whitney with two major modifications and several minor differences. Additionally, the authentic revolvers have slight variations, such as "C.S." stamped on the left side of the frame on some and on the right side on others. Some have the name "Spiller and Burr" stamped on the top of the barrel, while others have only the serial number. Some have original barrels as short as 6-1/8 inches, while the standard length was 7½ inches.

The first and primary difference is that all Spiller and Burr revolvers have one-piece brass frames, the Whitney is steel. Brass was used not only because of the shortage of steel, but because it was much easier to machine and replacement of machining equipment had to be kept to a minimum.

The second primary difference is that the threads of the Whitney barrel were exposed on the inside of the frame; due to the quality of steel used in the Spiller and Burr, the barrel threads were not exposed and the brass frame surrounded the barrel. This change simplified production, and the brass-surrounded barrel threads added needed strength at a critical point.

Due to the variations in well-documented original Spiller and Burr revolvers, plus the close similarity of reproductions, those thinking of purchasing an original are targets for unscrupulous fakers! Current value of an original is around $3000, so let the buyer beware.

The Dixie Gun Works' Spiller and Burr kit is an excellent replica. It closely follows the original, has enough changes

*Correct method of testing the trigger for amount of pull and smoothness of functioning parts is described in text. Note that the left thumb is between hammer and frame to prevent hammer from striking nipples. Right thumb is behind rear of trigger guard for support, while only tip of forefinger slowly pulls trigger.*

to make it hard to fake, but doesn't interfere with the function or enjoyment of building and shooting the gun. The barrel is seven inches and is stamped "Black Powder Only – Cal. .36," which obviously makes it a replica. There are a few other minor and modern changes, such as metric threads.

The kit arrives assembled and correctly timed; even the grips are inletted and assembled. While the gun is functional, it is left in the rough state with plenty of work remaining. No power tools are required. All you need to complete the kit are hand tools, elbow grease and patience.

The first step is a thorough inspection of the kit. During the inspection keep a sheet of paper and pencil handy to make note of any features that will require special attention during the project. For example, I noted that, on this specific kit, the hammer nose was not seating properly in the safety notches between the chambers.

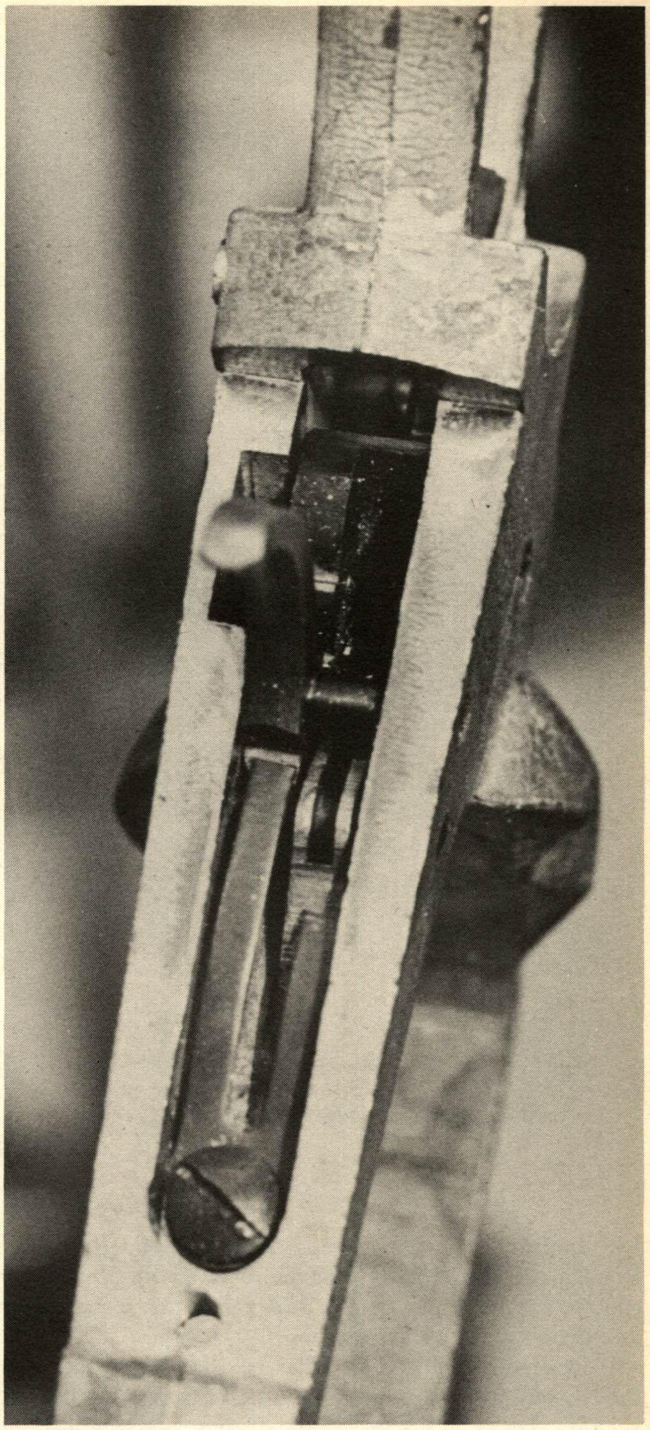
Notes made during the initial kit inspection will prove invaluable during the work stage. The more items noted – no matter how small – will help prevent overlooking something and should result in a superior finished project. As each item is corrected, check it off your list. This may seem like a small thing, but with every kit you are on fresh ground. To put it another way, would you begin a cross-country auto trip without a road map?

Without allowing the hammer to fall on a nipple, slowly cycle the revolver. Pull the hammer back slowly, noting any drag or roughness. Pull the trigger and ease the hammer fully down; again feeling and watching for any irregularity. Repeat until you have slow-cycled on each chamber. Now rapid-cycle the action until all chambers have been aligned with the barrel.

Slow cycle again, checking the ease of rotation of the cylinder by hand. Each time the hammer comes back, check for correct timing of the cylinder stop engagement in the cylinder stop recess cuts. Incidentally, this is sometimes called the cylinder bolt, or cylinder lock and its recess. Whatever the term used, it should hold the cylinder firm without any cylinder rotation. If you can wiggle the cylinder with the stop engaged this is incorrect, as the chamber will not be in parallel alignment with the bore! If fired, the bullet will strike the edge of the barrel and may shave some lead from the bullet. At minimum, the rear cone or funnel of the barrel will align the bullet, but at a cost of loss in accuracy.

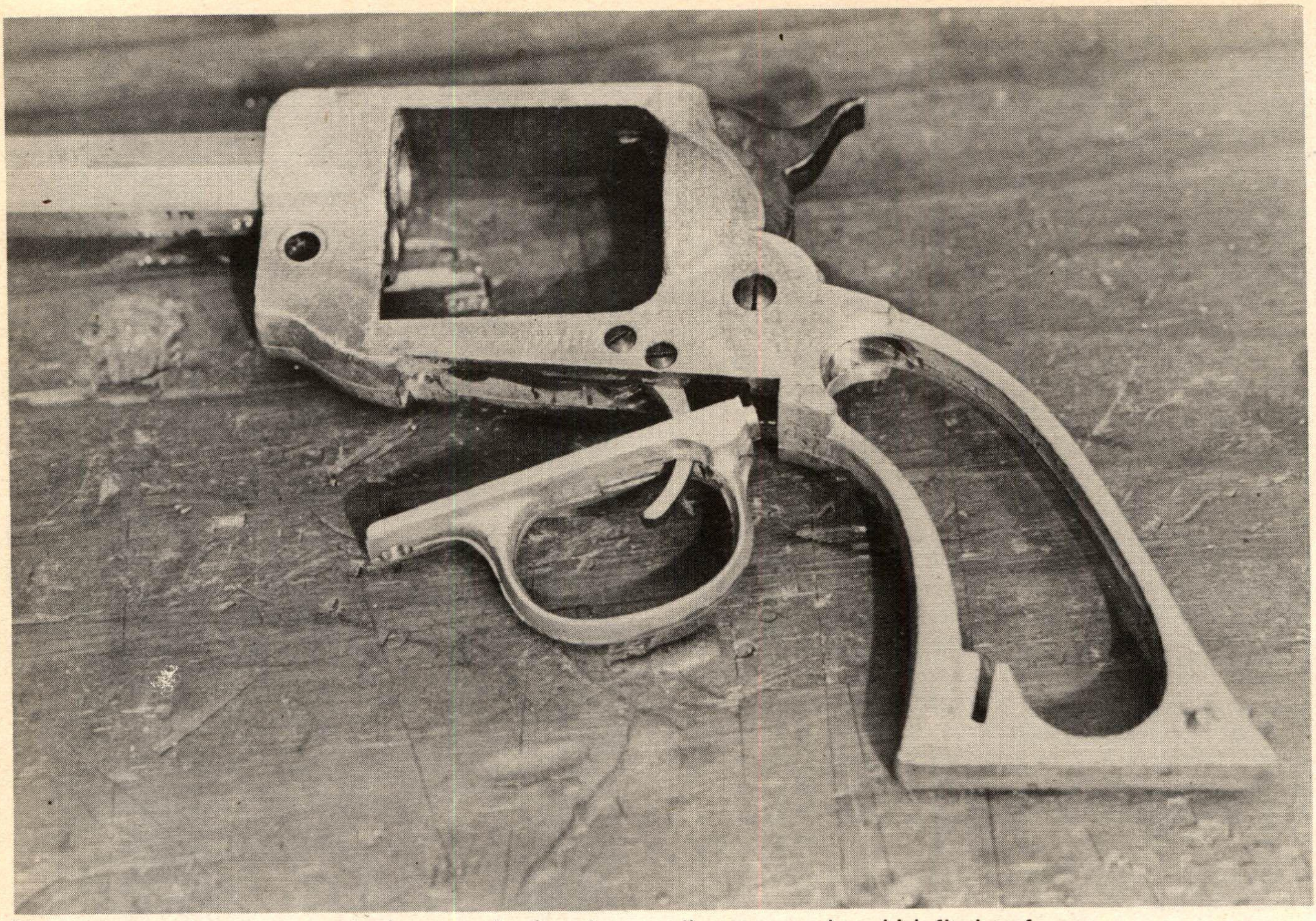
To check the trigger pull, cock the hammer, placing your left thumb between the hammer and the frame to prevent the hammer from hitting a nipple. Now, do not hold the revolver in normal fashion. Instead, place your right thumb behind the trigger guard, the top of your trigger finger on the trigger – the tips of your fingers are the most sensitive places on your body as they have the most nerve endings. With your right thumb providing support, slowly pull the trigger. This method amplifies the sensitivity of your fingertip about one hundred percent. With practice you can judge trigger pull to within plus-or-minus one ounce tolerance! A trigger pull gauge will not let you feel the rough spots in the sear and sear-notch engagement and release. This system will provide this information.

Another inspection trick – if you want to call it that – requires only a knowledge of each part or component and its sequence in the cycle. In quiet surroundings, hold the revolver close to your ear and close your eyes. Now slowly pull the hammer back, cycle the action and listen to the parts and components as each performs its function. Mentally you know what is happening as each part cycles and you can hear the parts function, either smoothly or roughly. Sound silly? Doctors, auto mechanics and many others employ the technique! You can learn to pinpoint problems not possible to detect any other way. Try it, then decide!



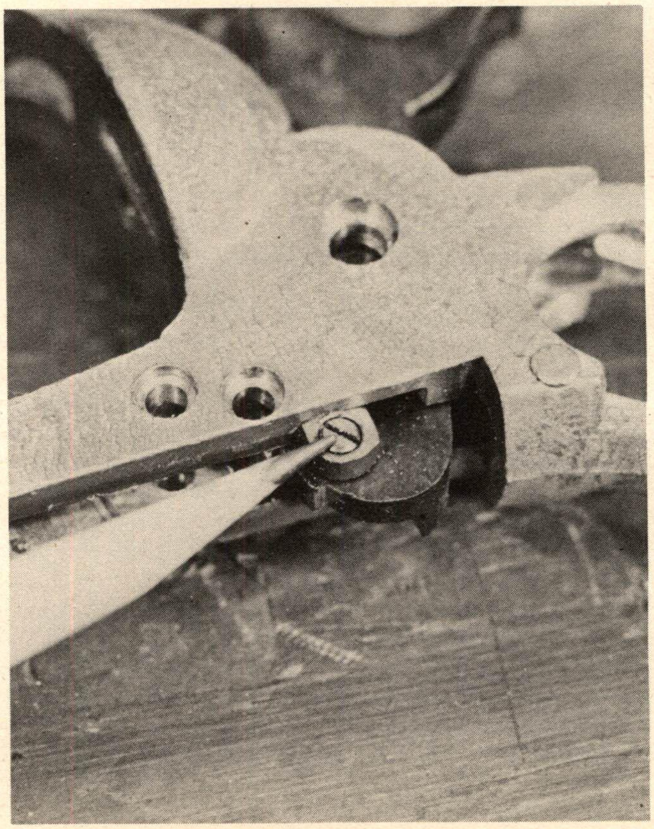
*Underside of Spiller and Burr frame with trigger guard removed and showing all components in place.*

When you have completed the full inspection and made your notes, you are ready to disassemble the kit gun. You



*With trigger guard screw removed, trigger guard swings down to disengage rear lug which fits into frame.*

*The hammer and hand are removed by first pushing parts down as shown and removing hand screw at point of pencil. Hand is then pulled down and out while hammer is pushed up and out of top of frame.*

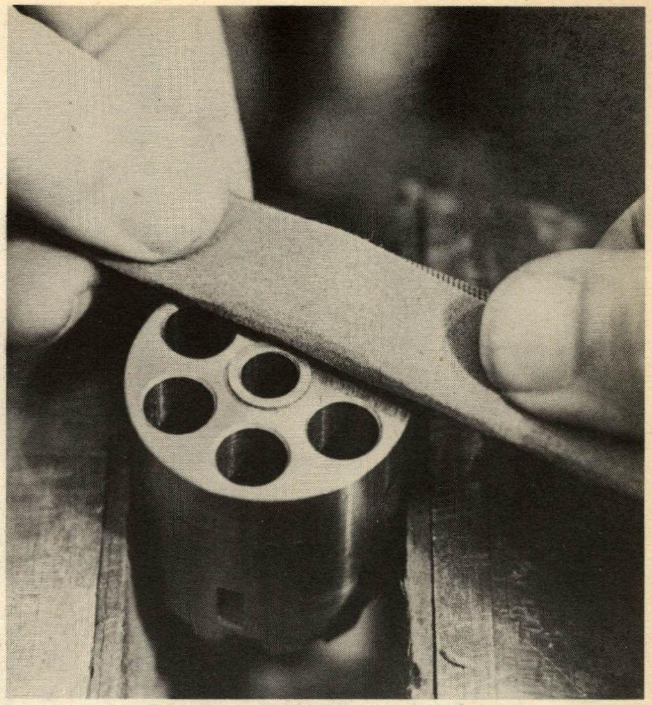


will find the sequence similar in many respects to the Remington New Model. Needless to say, your screwdriver should fit the screw slots. Remember the sequence, as assembly is in reverse procedure.

Disassembly is close to that of the Remington New Model, but with a little bit of Colt procedure added. To remove the cylinder, place the hammer on the loading notch, which disengages the cylinder lock bolt. Next remove the screw from the cylinder arbor cross pin – there is a small washer under the screw. Now tap the cross pin out. Unlatch the loading lever assembly, pull it straight forward and out of the frame. The cylinder may now be removed from the right side.

You will note a half-moon cut in the cylinder arbor where the cross pin engages it. You will also note a similar cut in the cross pin. If the cross pin is installed with this cut down, the solid part of the cross pin will fit into the half-moon cut in the cylinder arbor. In this position the screw and cross pin must be removed before the loading lever assembly can be pulled forward to allow the cylinder to be removed. If the cross pin is installed with its

*Aluminum oxide cloth, wrapped around file, is used to smooth face of chambers. Center pin recess rim is not touched unless cylinder action is binding.*



half-moon-cut up, the loading lever can be disengaged and pulled forward to allow the cylinder to be removed without disassembling the cross pin or its screw.

With loading lever assembly, cylinder and cross pin assembly removed, remove the grip screw. The grips, with installed washer, are then removed from the frame. Use a light hammer and punch to tap the hammer spring out of its slot in the frame, being sure the hammer is fully forward – it does not have a tension screw like the Remington, and is a stiff spring. To aid in reinstallation, lightly round the bottom corners of the spring, but do not shorten it!

Next remove the front trigger-guard screw. Swing the front end down, pull lightly forward to free its lug at the rear and lift it free of the frame. Remove the trigger and cylinder lock bolt spring screw and also remove the spring. Remove the cylinder lock bolt screw and lift the lock bolt out of its recess. Remove the trigger screw and lift it out of its recess. This all is best accomplished when the hammer is forward.

Now remove the hammer screw. As with the Remington New Model, push the hammer down until the small hand screw is visible in the trigger guard recess. Remove the screw and pull the hand and its attached spring down and out the trigger guard recess. Pull the hammer up and out through the top of the frame. The basic disassembly now is complete and you are ready to begin work. Remember that assembly is in exact reverse order. Also remember that the threaded screw holes are brass, and extra care should be taken not to cross-thread them.

While you were making the initial disassembly, you should have inspected each part and component. All information should have been added to your notes. For example, on this specific kit the loading lever assembly was difficult to remove from the frame. This raised the question of whether the arbor was too tight where it passes through the cylinder or where it passes through the frame.

As with all kits you can start several places, but with revolvers it is best to start at one end and work your way back to the other end. This kit is no different than any other, and the first order of business is to clean up burrs and rough machining marks. Incidentally, this cleaning-up step generally will solve many of the problems on your note pad.

The barrel muzzles on the Whitneys were flat, those on the Spiller and Burrs were lightly crowned, so I started at the muzzle. The kit muzzle is flat and has the usual machining marks. The first step is to remove the machining marks and get the muzzle nice and smooth. Wrap a piece of aluminum oxide cloth around a file and, with the barrel held muzzle-up in a padded vise, start smoothing the muzzle. Keep your strokes even and the file-backed aluminum oxide cloth level. Take care not to bevel the end of the muzzle.

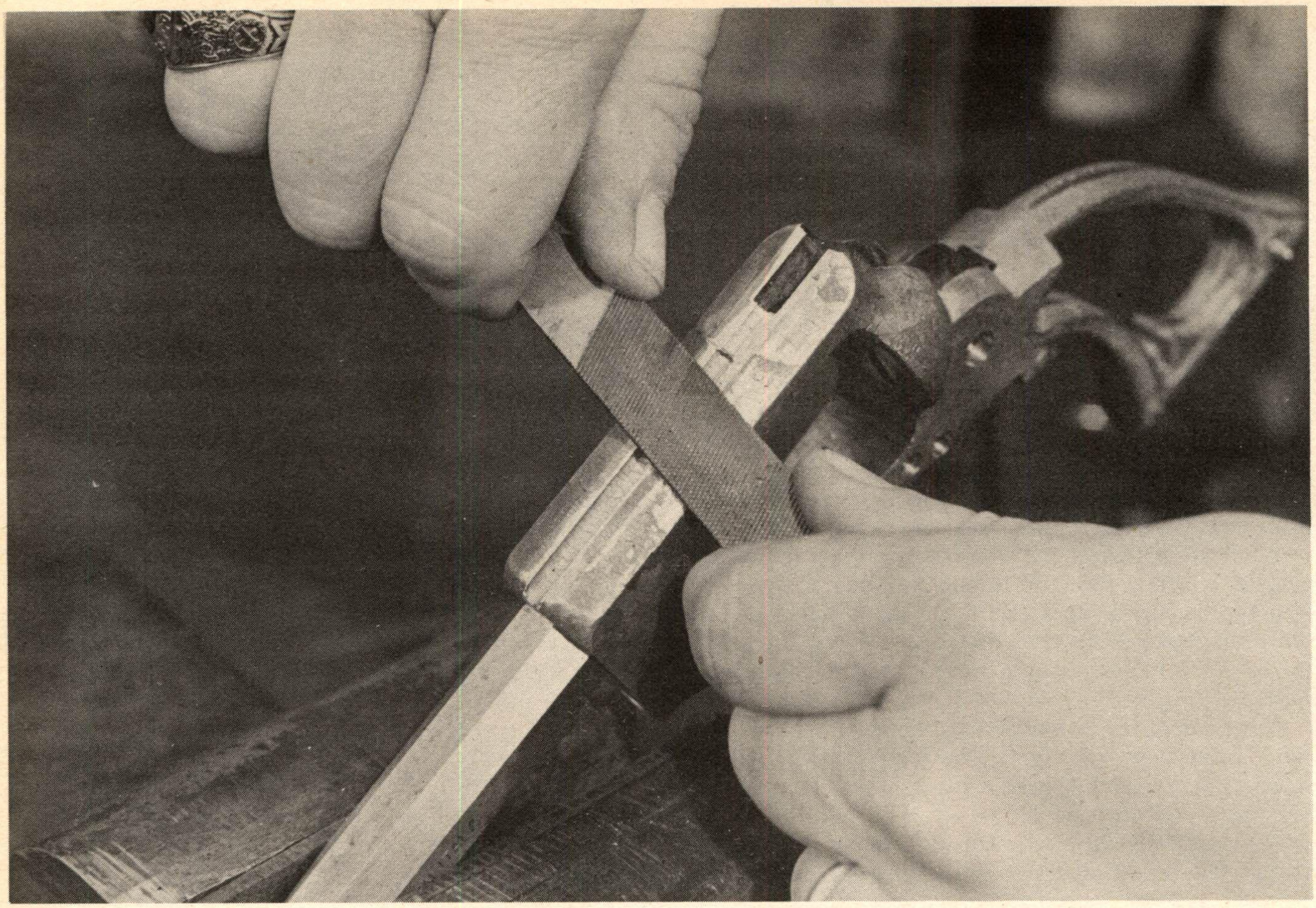
With a short piece of fresh aluminum oxide cloth laid on the muzzle, press down with your thumb; your thumb will compress and a wee bit of the aluminum oxide cloth will enter the bore. Maintaining pressure, rotate the aluminum oxide cloth clockwise, 360 degrees. Then, without relieving pressure, rotate counterclockwise for 360 degrees. Three or four repeated cycles will lightly crown the muzzle evenly on all sides. Now use a needle file to lightly round each of the outside flats at the muzzle edge. When all flats are equal, the job is complete.

Now move back down the barrel and underneath to the loading lever latch stud. Remove any burrs. Lightly bevel the forward edge and smooth the latch notch using Arkansas stones. Be sure not to change the notch angle, just slick it for smooth operation.

As the loading lever operation on this kit had been stiff, the problem was to locate the source of trouble. Slipping the cylinder over the loading lever arbor revealed a firm, but not-binding fit of the two components. Obviously the problem was in the arbor hole in the brass frame. With the cylinder removed, the arbor was inserted in the frame and became difficult to seat. Now came the time to think the problem through. If the loading lever arbor is polished it will no longer have the desired snug, but free fit through the cylinder. The solution is to polish the arbor hole through the frame. However, this must be done slowly with constant checking so as not to enlarge the hole too much.

As this is a close area, a wooden dowel was wrapped with aluminum oxide cloth for a snug fit in the arbor hole. This was pushed back and forth several times while twirling the dowel with the finger tips. Rechecking with the loading lever arbor revealed a closer but still too tight fit. The procedure was repeated. This time the fit was almost perfect. Next, another wooden dowel was wrapped with four aught steel wool and used as the tool – steel wool cuts very lightly, removes scratch marks and polishes. On the next try the fit was perfect. The rear hole for the arbor fit perfectly without this procedure.

While checking the loading lever assembly, it was noted that the joint where the lever and the arbor joined was burred, causing stiff operation. The cross screw was


*Single cut file is used on brass frame to smooth the metal. Careful draw filing technique should be learned.*

removed. Each joint arm was cleared of all burrs with a flat needle file and, when reassembled, the operation was smoother but still stiff. It was again disassembled. A strip of aluminum oxide backed by the needle file was used to polish all surfaces. When again reassembled the fit was snug but operated smoothly. A drop of oil on each section of the joint, a few back-and-forth operations of the joint and it was slick as glass.

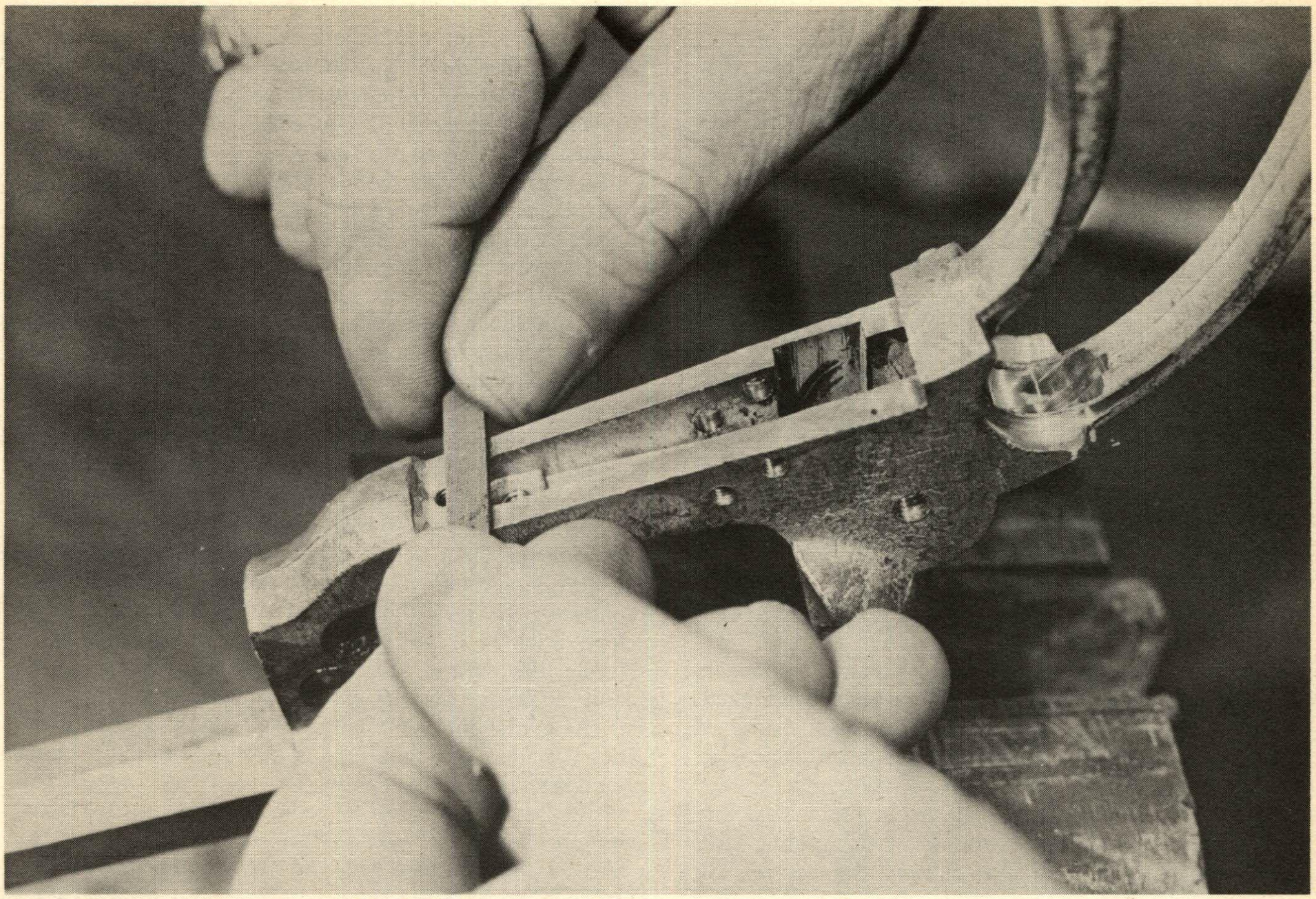
The rammer joint worked without binding, but to increase smoothness its screw was removed, the parts separated and lightly polished with the aluminum oxide and needle file. When reassembled it functioned as smoothly as the other joint. As a final test, the loading lever assembly, cross pin and cylinder were reinstalled on the frame. The function was excellent. As an added touch, the loading lever catch bevel was smoothed with an Arkansas stone. When the lever was pressed up the catch cammed back, then snapped firmly into the stud under the barrel that had previously been smoothed.

With the loading lever assembly functioning correctly, the cylinder came next. The chambers were nice and smooth and required no work. Even the front edge was correctly beveled. The front of the cylinder had some machining marks. Again, aluminum oxide cloth was wrapped around a six-inch file and used to smooth the outer edge directly over the chambers. This is just a polishing operation and should not be done using only a file – to do so would increase the space between the cylinder and the barrel.

The locking bolt recesses in the sides of the cylinder were cleared of all burrs and the locking bolt inserted in each to assure a snug fit. All burrs were removed from the rear of the cylinder. As the hammer had failed to enter the safety notches between the nipples, this was checked. The problem was caused by the rear of the safety notches not being cut low enough. With the cylinder secured in a padded vise, the rear edge of each of the safety notches was filed deeper. The hammer fit into each when checked outside the frame. The cylinder and hammer were then reinstalled on the frame for the final check. The hammer fit into each notch correctly and no additional filing was necessary.

With the components disassembled, the insides of the brass frame were carefully checked for burrs. Only a few were found in the cylinder area, and removed. The hammer entrance notch in the top of the frame was cleared of burrs, the sides maintained straight by careful filing.

The insides of the frame where the parts function were checked for burrs. A few were found and removed with needle files, the brass polished with small sections of aluminum oxide cloth wrapped around needle files. This is only a burr removal, smooth-up operation, so do not file or overpolish. All you want is a clean, polished brass surface.



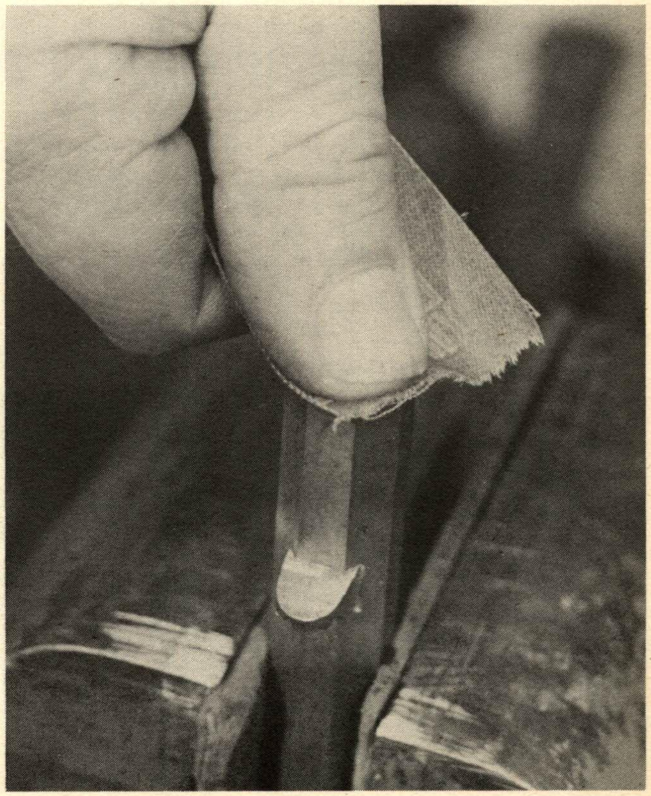
*Pillow file is used to clean up rough machining marks on trigger guard recess of frame.*

Excess filing or polishing will result in a sloppy fit of parts and components.

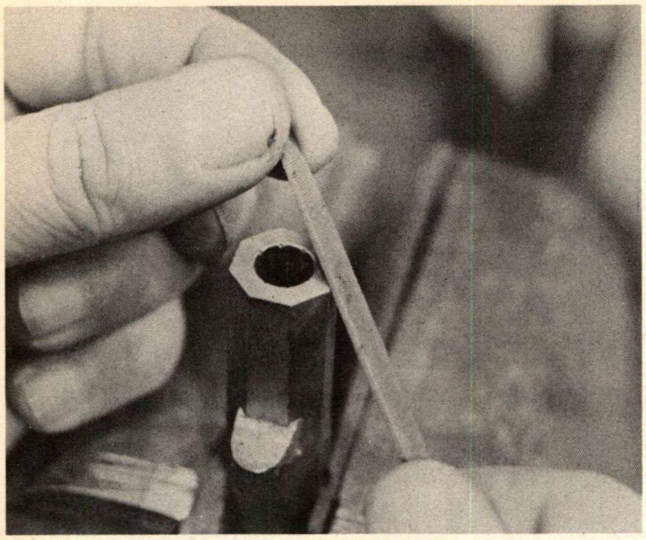
Next check the action operating components for burrs. Again, some were found and removed using Arkansas stones. I personally prefer to use stones for this work whenever possible. Aluminum oxide cloth with a metal backing can be used but flexes too much, while the stones are firm and give more precise control. This is also a burr removal, smooth-up operation and excess metal removal should be avoided.

The hammer sear notches, trigger sear, tip of the hand and the locking bolt should not be touched unless there is a problem. If a problem exists on any of these, have a professional gunsmith do the work or supervise your work. If you are confident that you can do the job, remember the number one rule: Smooth the part with Arkansas stones but do not change the original angles!

The final function work is fitting the brass trigger guard to the frame. It should seat fully without a gap between it and the frame. On this kit it was only necessary to remove small, rough machining marks on both parts and the fit was correct.



***Careful work with aluminum oxide cloth and thumb will lightly crown muzzle. Thumb compresses cloth slightly and enters bore, making 360-degree turns.***



*Outside flats of muzzle are lightly tapered by careful filing. Each flat is clean and equal.*

Go over each of the disassembled parts and components for a final inspection. If nothing has been overlooked, reassemble the gun. As you reassemble, check the fit of each part and component. If you spot a rough place, stop and correct it. Clean the chamber, nipples and bore.

With the gun reassembled, cycle the action at slow rate and rapid rate. Check the operation of the loading lever assembly. If you have done your job right, the function will be smooth and trouble-free.

Test fire with percussion caps only. If all goes well, test with a blank load in each chamber. Start with a light load and, if you encounter no problems, work up to a full charge in each chamber; use a slightly heavier load each time. Note any problems that will require additional work.

If the gun passes the function test, clean it thoroughly and disassemble for the metal and wood preparation phase. Check each part and component as you disassemble. If any mechanical problem has occurred, correct it first.

The steel parts of this kit were very clean and required draw-filing in only a few places. Aluminum oxide cloth wrapped around a file was all the equipment necessary to bring the steel parts up to finish polishing. Just take your time, work slowly and retain the original lines. As your strips of aluminum oxide cloth become worn during initial polishing, save them. Switch back to these for the final polishing; they cut little and primarily bring the polished metal to a nice sheen. If you wish, four aught steel wool can be used to burnish the steel.

Preparation of the brass frame is best done with hand tools. Power tools have a tendency to dig in too quickly on brass and, if used, extreme care must be taken. The frame is a brass casting with machining done only in the areas that hold other parts. The rest has received a quick cleanup, but essentially is the same as the day it came out of the mold.

The primary thing to remember is that you want to remove only the rough exterior appearance until you are down to clean brass, then stop! Excess filing is neither necessary nor desirable. To do so will only result in losing the original lines of the frame. As brass files easily, there is a natural tendency to file too much.

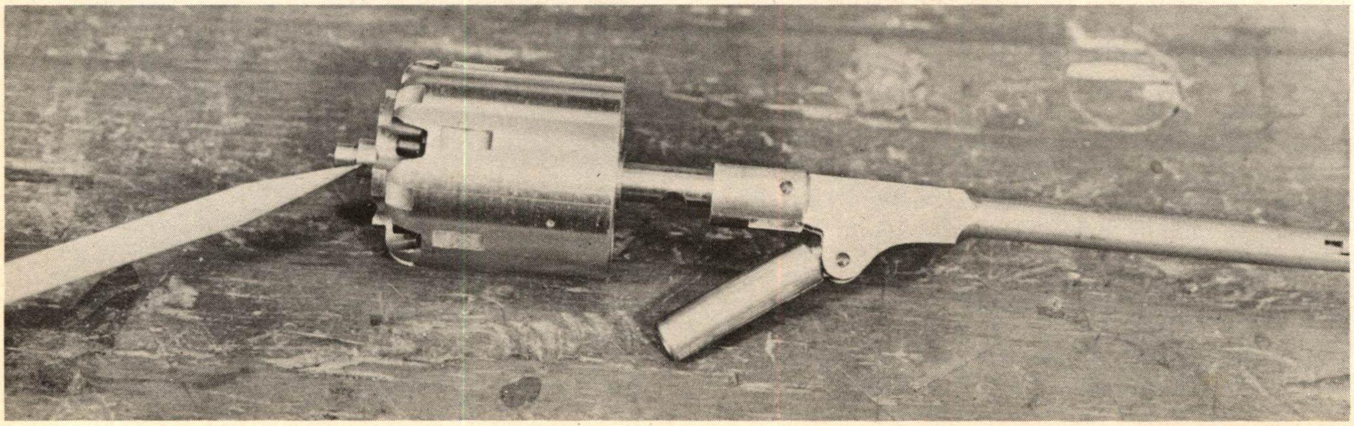
Single-cut files work best as they cut the brass cleanly. The only problem is that brass tends to clog the file. To avoid this – which will produce scratches – use a file card constantly to keep the cutting teeth of the file clear of clogs. Stick with the single-cut file as much as possible. Needle files must be used in difficult areas but they clog easily, so use the file card often to keep them clean.

The gun should be totally disassembled except for the trigger guard. This should be in position with the trigger guard screw pulled up tightly. The frame and trigger guard are filed as a single unit. If separated – except for initial cleanup of the trigger guard where it does not contact the frame – the two parts will end up being unequal. This is especially true on the sides, front and rear of the trigger guard where it touches the frame.

Try to draw-file as much as possible. On the sides of the frame lay the file flat and push forward to cut. Lift the file, clean if necessary, and reposition for another forward push of the file. This is pushing the file front end first and straight forward. Do not make a backward pull stroke as the file will not cut and, usually, imbedded brass particles in the file will cause scratches. It is the same procedure as draw-filing, except the stroke is parallel to the length of the file.

Switch to the needle files whenever you come to a rounded or irregular-shaped section of the frame. Needle files cut best in a straight forward push; lift the file from

*Cylinder is installed on center pin to check for binding. Pencil points to rear of pin which will enter a matching hole in frame of revolver. Note finish of cylinder at this point of assembly.*



the surface and reposition for the next push cut. Work slowly and carefully.

In all of your filing, remember to maintain the original lines of the gun. It is easy to change or spoil the lines, so keep this in mind at all times! It is not difficult to file the casting clean. For some reason, the average person just gets file happy on brass and files too much too quickly!

After the frame has been filed and all casting scale removed, install the grips. Be sure the brass washers are below or at least level with the surface of the wood. Pull the grip screw up tightly. Now, using metal files, shape the grips until they blend and match the brass frame perfectly.

Next switch to aluminum oxide cloth wrapped around a file. Use this to sand the grips. The grips should be finish-sanded on the gun and removed only when they are ready for their finish to be applied. If sanded off the frame, ninety percent of the time the edges will not match the metal.

With the grips and brass frame around the grips completed with the aluminum oxide cloth, remove the grips. Use aluminum oxide cloth around files and go over the complete frame. This step is to remove all traces of filing and any scratches. You are not reducing the amount of brass, only cleaning your filing and getting the brass surface smooth. Take your time and do a good job.

The final step is burnishing the brass with four aught steel wool. Do not use a coarser grade. The steel wool will remove the tiny scratches and give the brass a soft sheen appearance.

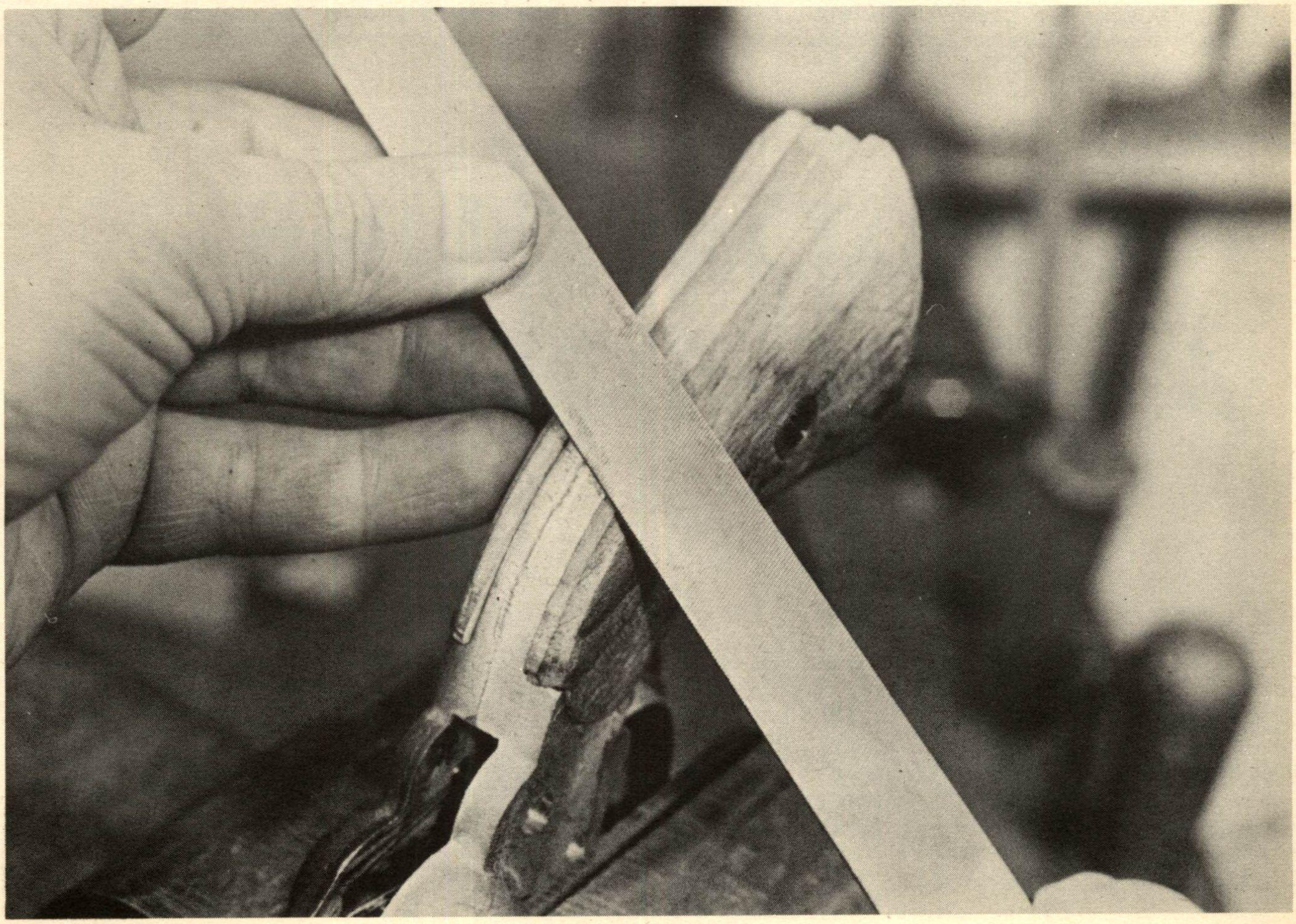
The specifications for the Spiller and Burr were blued steel and oil-finished grips. All chemicals were in short supply in the South during the war, and both of the two originals I have examined showed no signs of bluing. They were natural-aged brown. As browning does not require fancy chemicals, it is logical to assume that the factory used what was available. So, you can follow the original specifications and blue the steel parts or you can brown them.

I would not recommend commercial hot salts bluing. The barrel is tight in the frame, which would require that both parts be placed in the bluing tank. The brass will not blue, of course, but the thirty minutes to an hour immersion at 285 degrees could affect the strength of the brass. The best solution is to use one of the Birchwood Casey Muzzle Loading Finishing kits, available in bluing or browning.

The grips can be finished with boiling Linseed oil, True-Oil or any similar modern finish. If True-Oil is used, compound the high-gloss finish back to a soft sheen.

Finally, place a drop of oil on all moving parts when reassembling the kit. The kit is finished and ready to use and to admire. It is a reproduction of a gun produced under extreme difficulty by basically an agricultural section of our nation in a great struggle for a Lost Cause.

*Metal files are used to shape grips while attached to brass frame. Wood and frame are shaped together.*

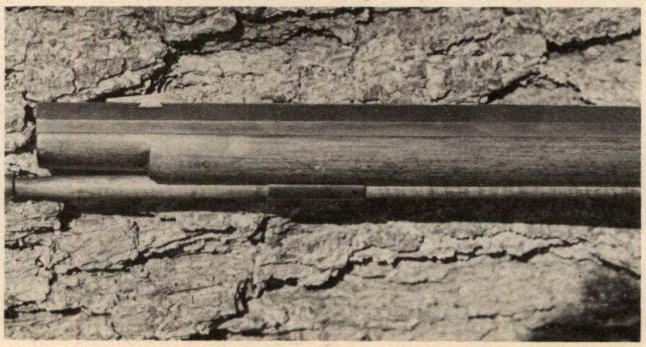


*Author Ralph Walker with Dixie Gun Works new Tennessee Mountain Rifle, serial number 001. Percussion lock rifle could not be fired by Walker but authenticity was considered excellent, adhering closely to original long rifle.*

## CHAPTER 17

# CUSTOM GUNS AND RESTORATION

*Like the original Tennessee Mountain Rifle, the Dixie version has no metal nose cap or ramrod tip.*



FOR LACK OF better terms, most available black powder kits are what might be termed simple and standard; they are the first two steps up the ladder. This statement is not meant to be derogatory; these kits are fun to build and, if completed correctly, are sources of pride and practical use in black powder shooting. My reason for using the terms simple and standard is to underscore the mechanical fact that most of the hard work has already been accomplished by the manufacturer or importer.

For years the third step in the ladder, which could be

# The Customizing And Restoration Of Muzzleloaders Is The Top Of The Ladder For Black Powder Gunsmiths

referred to as the advanced kit, has been missing. There are a few kits available that almost reach this step, but, in my personal opinion, they fall a wee bit short; although they qualify fully as being tops in the standard category in quality and the extra efforts and skills required for assembly and finishing.

During a phone conversation with Turner Kirkland of Dixie Gun Works quite recently, he asked me if I had seen their new Tennessee Mountain Rifle. When I answered no, he began describing the rifle and the more he talked the more my interest grew, in direct proportion! Stretching friendship to the limit, he finally agreed to ship to me both a complete rifle and a kit version, with the strict understanding that I would resist temptation and not fire the completed rifle or build the kit; they were to be photographed only and returned as quickly as possible.

Eventually, two large boxes arrived and, by luck, the first one I opened contained the finished rifle, serial number 001 with percussion lock. The second box contained the kit, serial number 003 and flintlock. It was then I understood why he was so persistent in obtaining my word of honor promise; I assume serial number 002 is the finished flintlock rifle version and 004 the percussion kit.

While the opportunity to examine and study any gun with these collector serial numbers is not an everyday occurrence, this was not what impressed me. I had seen similar rifles before, but only as part of prized collections or a single firearm handed down in a family and just not for sale.

To fully appreciate the rifle, you have to know a bit of history of a specific geographical area and understand something about the people who have lived there through numerous generations. The rifle is correctly named; it was developed in Tennessee and is a distinct type not found in any other area.

The mountains of Tennessee are beautiful, but life there is no bed of roses. When the early settlers moved there in the late 1700s and early 1800s, they brought only the bare essentials. They depended on the natural resources as the raw material for their livelihood and everyday requirements.

The Kentucky/Pennsylvania rifle was considered a necessity, but time and the rugged everyday requirements soon took their toll; constant repair by local gunsmiths could not stem the tide of wear, and replacements from the East were just too expensive. As a result, a new rifle began to take form, slowly, but surely.

Native iron and woods were utilized by the gunsmiths – then, as now, a self-reliant people who place emphasis on practical use, with little interest in shiny brass fittings and fancies. The local rifles were literally handmade, lock, stock and barrel with total emphasis on dependability.

Excluding the barrel, the only metal used in front of the lock are the round, plain-iron ramrod thimbles – not even a metal nose cap or ramrod tip! Behind the lock, in the butt section, is a plain-iron butt plate and toe plate. No fancy elaborate patch box, only a simple hole in the stock to hold grease for the patches. The lock and double-set triggers are plain on the outside. Inside, no effort was spared in shaping each component until the mechanism functioned like a fine watch.

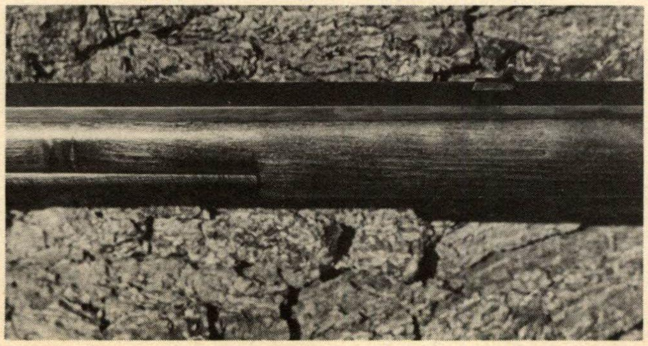
To the casual observer, these rifles look as plain as a fence post. Yet the gunsmiths who made them transferred this very plainness into graceful works of art! The style prevailed until well into the 1900s, but with each passing year gunsmiths who could build the rifles grew fewer in number.

By again making this style rifle available, Turner Kirkland has saved one more classic rifle from becoming lost to black powder shooters. It is not a replica, but actually a reproduction! I feel it is that third step.

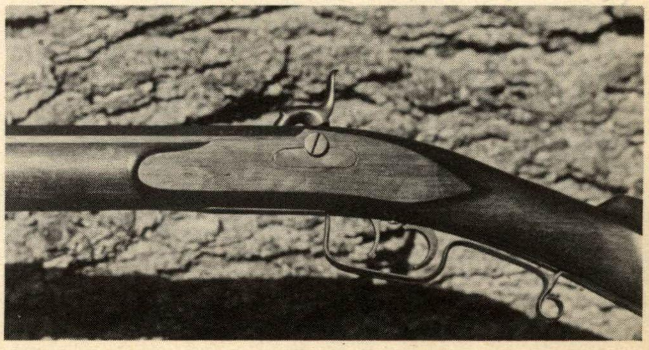
The barrel is 7/8 inches across the flats, 41½ inches in length, in .50 caliber with .010 rifling, six lands and grooves and a 1x56 twist. The stock is one-piece walnut, fifty-six inches in overall length. The lock is 4¾ inches long, 7/8 inch wide and of the early Schultz style with fly. Triggers are double set, double action. The front sight is a brass dovetail with a silver blade insert and the rear sight is a wide buckhorn. The trigger guard, butt plate and toe plate are of steel.

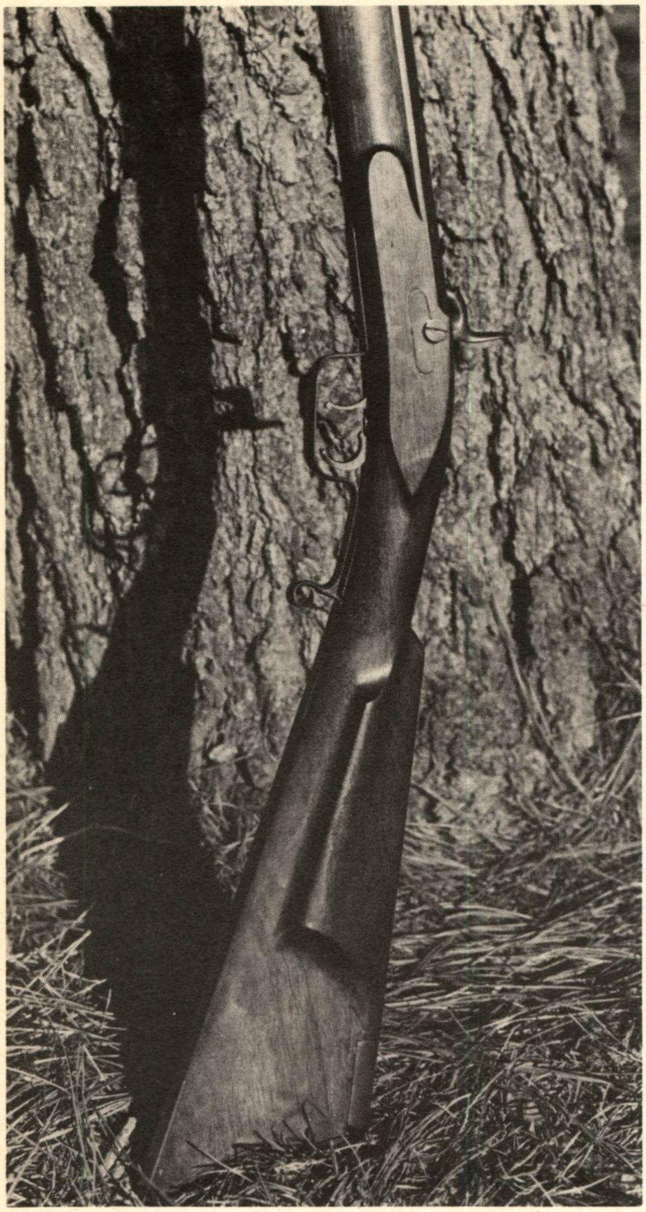
The finished-rifle version has a deep, mellow, brown metal finish, the wood oil-finished with just a tinge of

*Somewhat unusual step in forend is where ramrod enters stock. Gun is typical of early Kentucky/Pennsylvania.*

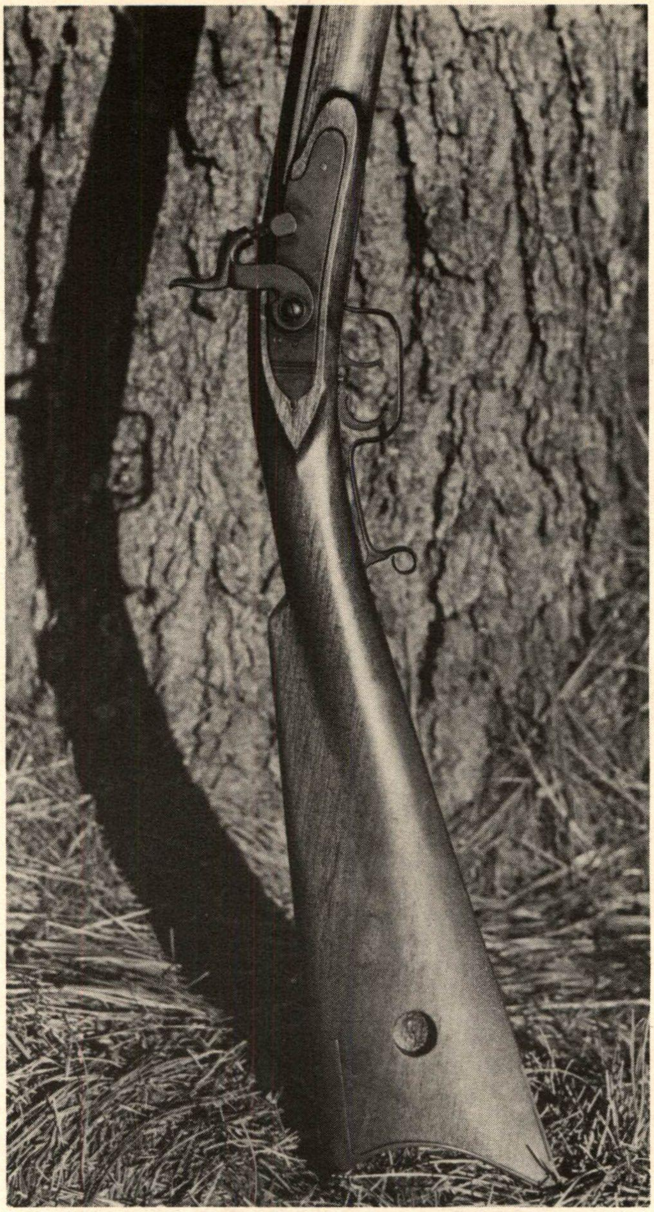


*Square-style trigger guard and one lock retaining screw of iron adds authenticity to Tennessee replica.*





*Left side of butt stock shows cheek piece and flowing lines which make the simple style attractive.*



*Right side reveals no patch box; simple grease hole.*

antique red shade. The balance of the rifle is excellent, coming up easily right on target the first time you hold it to your shoulder. It was an awful temptation not to shoot the rifle! According to Kirkland, it handles the .50 caliber Maxi ball well, in addition to its usual .490 round ball with .010 patch and 65.0 grains of FFg black powder.

The kit version is definitely not a "toss the parts in and tighten the screws Charlie" type! On the other hand, it is a work of precision from butt to muzzle with every line correctly laid out in shape, contour and correct alignment that is easy to follow. While I could not do the actual assembly, it was obvious that just the right amount of excess wood had been left at each point for perfect fitting without a single gap in metal-to-wood fitting.

Barrel tenons are securely mounted to the bottom of the barrel, but the cross-pin holes through stock and tenon would have to be drilled; likewise the thimbles. Sight dovetails are close, but would require hand-fitting. The breech plug and tang unit are not installed, and a finger-pressure trial also indicated the requirement for final hand-fitting. Incidentally, a hole drilled in the breech plug eliminates the need for a wrench. This is an old, but very practical touch: typical of the simple, but efficient and practical approach of this style rifle.

Careful cycling of both the percussion and flintlock samples indicated they were exceptionally smooth. Perhaps a top-notch gunsmith could squeeze a bit more smoothness out of the locks, but it would require hours of careful and precise work! The double-set, double-action trigger is of the same quality.

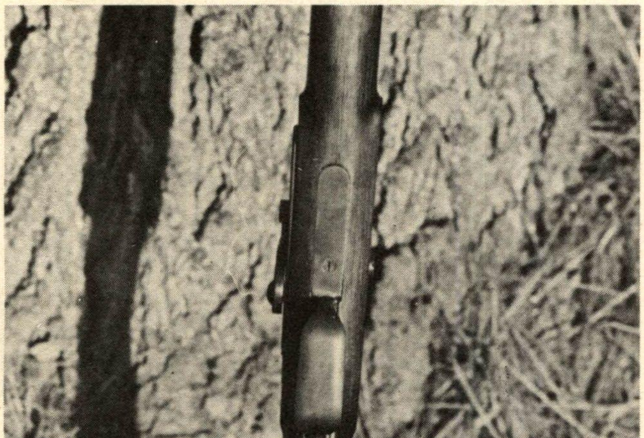
In summation, this is an advanced kit in every sense of the word. At the same time, it is not beyond the ability of anyone who will take the necessary time and patience to assemble the kit. No power equipment is required, only hand tools and elbow grease.

There is no question about its success, for it has a unique appeal. I am glad that Dixie and several other companies are now introducing advanced kits. The future potential is great, for there are many more fine black powder guns that rightfully deserve reproduction and should receive good public acceptance.

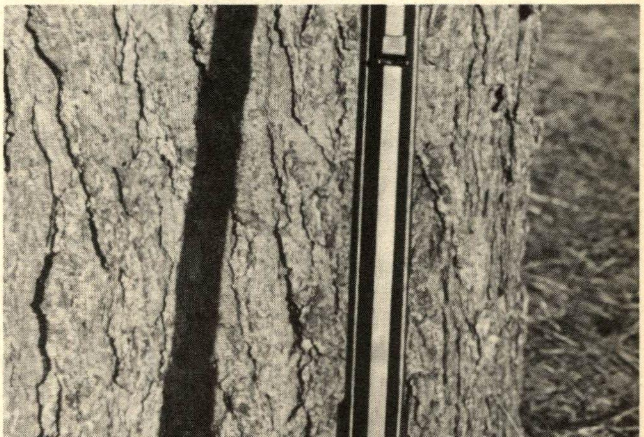
The fourth step up the ladder is the semi-custom gun, also sometimes available in the form of a rough kit. A good example is the Dixie Gun Works Pennsylvania rifle, the gun Turner Kirkland first put on the market.

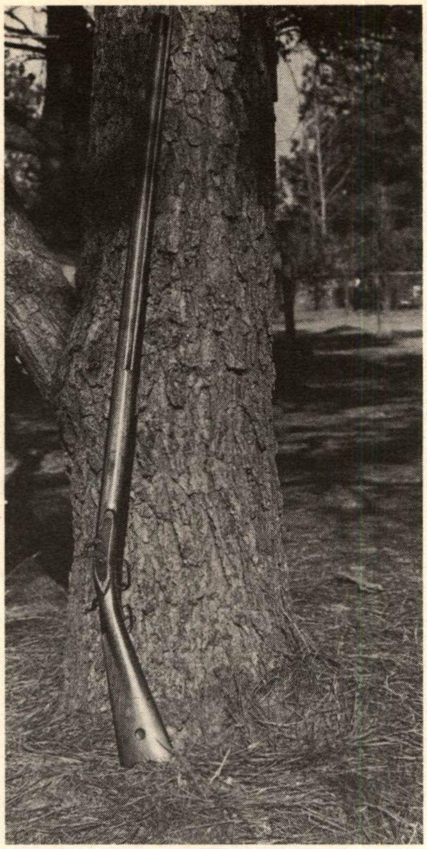
The potential builder has a series of recommended parts and components to choose from for a basic kit. They range from the standard to the deluxe version, with each

*Iron toe plate is visible on bottom of butt stock.*



*Top view clearly shows slenderness of entire stock.*



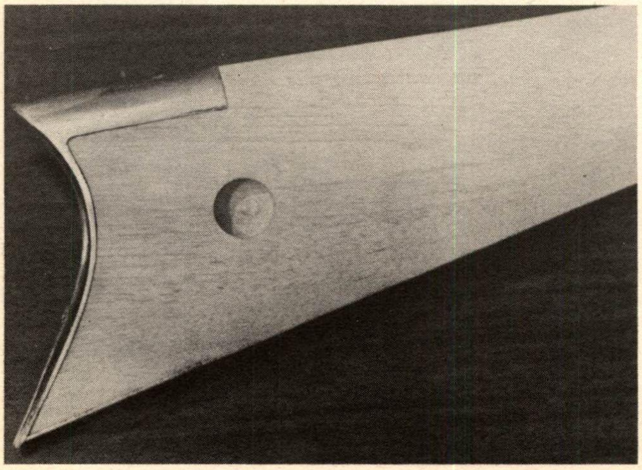


*Full-length view of Tennessee Mountain Rifle; simple, without accessories, elegantly beautiful.*

component specified. There are additional accessories and fittings to add or exchange on each basic kit – a builder can order just kit number 101 (the standard rifle), or he can omit or change components in the kit. The same system is used for the number 134 super deluxe kit, which has silver furniture instead of brass as in the standard kit.

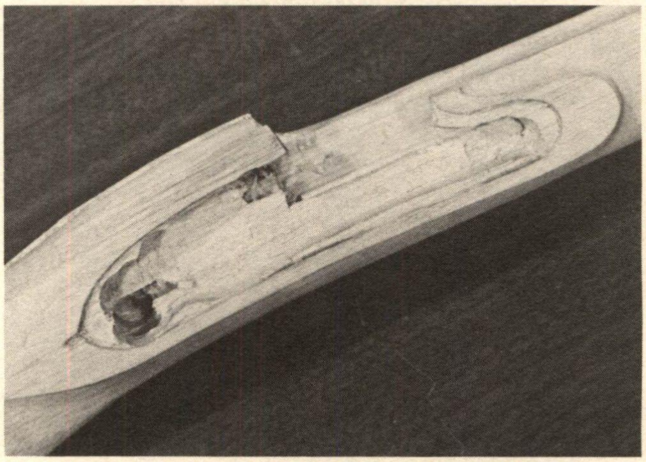
The second type of semi-custom rifle is somewhat similar and is available from many firms, as well as Dixie. The main difference is that the builder chooses each and every component. He may select the barrel from one source, the stock from another and the lock from still another source.

As components are being selected, a considerable amount of work will be involved. Usually the lock is in finished form, although some lock kits are available. A good example are the handmade locks produced by Michael Fallon of Fallon Locks, Incorporated, 2412 South E. Street, Richmond, Indiana. They are literally works of art. The various barrels are rough machined on the outside but fully rifled inside. The breech may or may not be pre-threaded for the plug and tang, depending on manufacturer. Stocks range from rough blanks to some with the barrel channel partially cut and the butt stock roughly shaped. The furniture, available from a variety of companies, is usually rough castings.



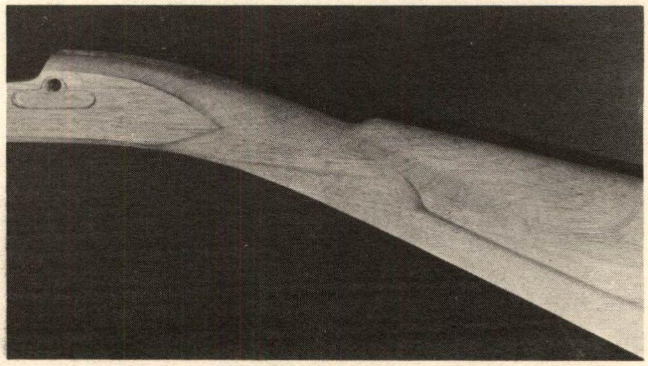
The semi-custom rifle offers the maximum in individual taste and ideas; however, it is not for the beginner with little experience. Several companies offer blueprint-type plans that are helpful. The book *Re-creating the American Longrifle* by Buchele and Shumway is probably the most helpful in building a semi-custom rifle.

I would recommend that the potential builder assemble several of the other more standard kits before attempting

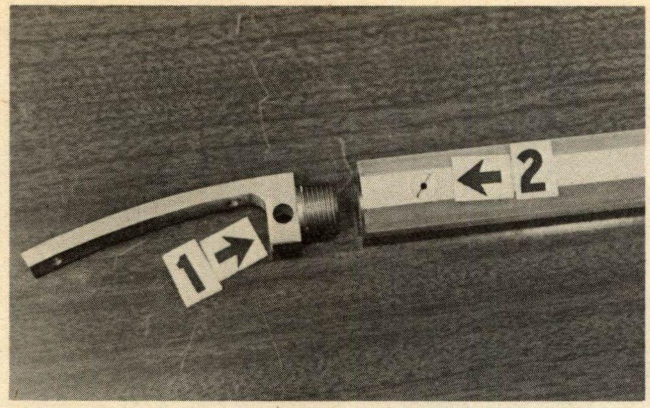


*Pre-inletting of Dixie stock is not complete and requires more inletting to ensure perfect metal fit.*

*Lines of stock from left side are well established but will require considerable work before final finishing.*



*Kit version of same rifle, at left, leaves the more advanced blackpowder gunsmith with room to customize.*




*Authenticity of original is followed as the threaded one-piece tang and plug show pre-drilled hole at arrow No. 1 which eliminates the need for a wrench, as did the original guns. One concession to modern procedures is at arrow No. 2, which is stainless-steel touch hole insert that may be removed for cleaning without removing barrel.*

such a project so as to gain the necessary experience and practical knowledge. Next, he should thoroughly study and plan the project down to the smallest detail. A good selection of black powder manufacturers' and distributors' catalogs will prove invaluable in the planning stage.

At the top of the ladder is the full-custom rifle. As in the originals, every piece, part and component is created out of raw material! The barrel can be made the old way, but for safety reasons it is best to buy a round barrel blank of modern steel. Only a pilot hole is drilled. It must be reamed to land diameter and the rifling grooves cut. The outside is machined or filed to shape.

Fifteen years ago there probably were not more than two dozen gunsmiths capable of such a project. Today, the ranks are steadily growing, another phase in the re-birth of the black powder era.

To reach the top of the ladder is not easy and requires sincere dedication. However, while on the way up, there is nothing to prevent the black powder gunsmith from custom building one part. For example, a ramrod made from good hickory wood and the tips made from raw material is a practical project that helps develop the knowledge and skills for more custom work later.

A trigger guard filed from a rough casting, butt plate, toe plate and other components will add the personal touch to a factory kit. Decorative furniture cut from sheet brass or German silver provide personal touches and help acquire knowledge. None of these custom projects require massive tooling, and slowly the necessary skills will be acquired.

A person does not become a professional gunsmith with the touch of a magic wand. He studies every bit of information he can find. He studies the work of other gunsmiths. Lastly, but far from least, he learns by his own personal trial and error. Most of all, he is never fully satisfied with any job and tries to make his next effort better!

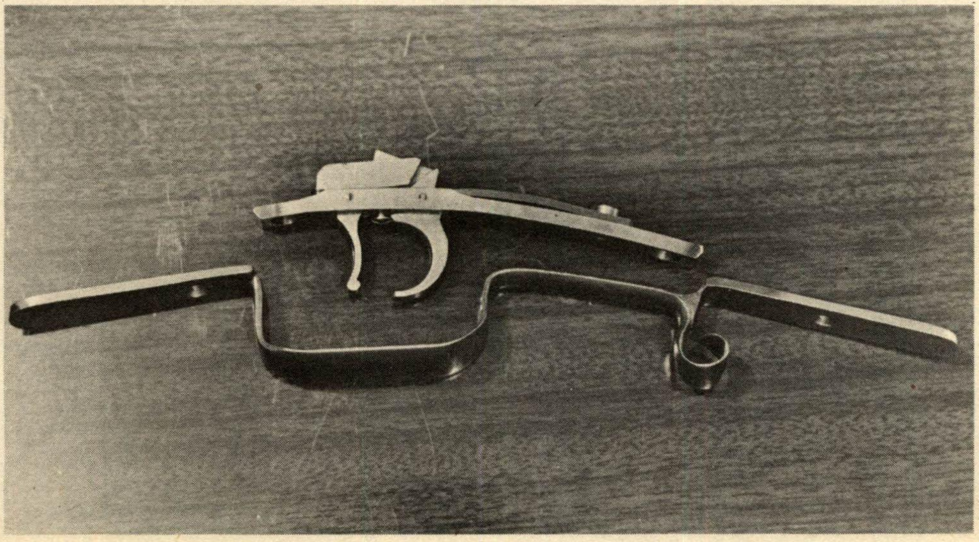
Keep this in mind when climbing the ladder. No matter how small a custom part you build and add to a kit, it no longer remains a factory kit! Just assembling the kit with all the factory parts provided has, in a way, made it a custom gun; if laid beside a factory version, the difference would be obvious. Add just one custom item to take the place of the factory item, and the change is even more obvious.

Keep your initial projects confined to those parts and items that do not affect the function of the gun. This offers plenty of latitude to work in and allows so many changes that the manufacturer would have a hard time recognizing his own product!

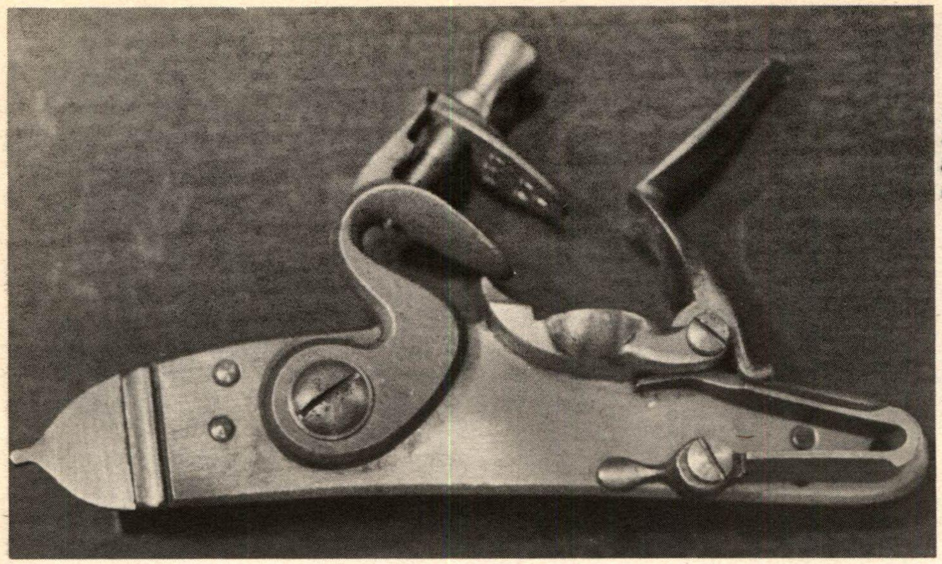
When you reach the lock, trigger and barrel, the number one priority is safety! Probably the best place to start is smoothing the function of the lock and trigger. As previously mentioned, most of these can be greatly improved with careful stoning to reduce friction. Avoid the sears and sear notches; approach them only under the supervision of a good gunsmith. Play it safe and always have any lock work checked by a gunsmith before firing the gun.

All re-barreling, barrel additions in a different caliber, or any barrel alteration should, at first, be done under a gunsmith's supervision. Even later it is just good sense to have your work inspected to assure safety. Only when you are one-hundred percent sure of your ability should the gunsmith's inspection be omitted.

Take your time going up the ladder. Take pride in your work, no matter how simple the project. I have spent a



*Double-set, double-action triggers require no fitting. Square-shape steel trigger guard is typical.*



*Right side of excellent quality flintlock. Functions well for average shooter although builder may wish to smooth action a bit.*

lifetime in gunsmithing and while I take pride in the finished product, what I really enjoy is doing the work itself!

The restoration of original black powder guns is perhaps the most interesting and rewarding aspect of black powder gunsmithing. It also is the most demanding in technical skill and knowledge, plus historical knowledge. In the hands of a knowledgeable gunsmith, a gun one step from the junkyard can be saved for future generations to enjoy. By the same token, a valuable antique requiring only minor restoration can be totally destroyed in the hands of a gunsmith or hobbyist not qualified to perform the work!

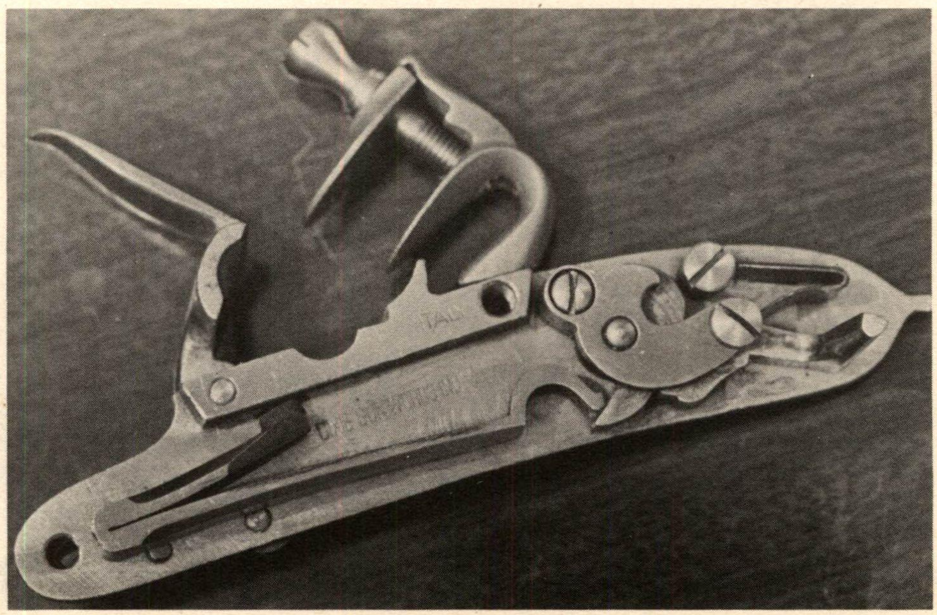
There is one cardinal rule in restoration. Know exactly what is required and be fully capable of performing the work or leave it alone!

There is no loss of honor or prestige in admitting that you are not qualified to perform one or more phases of restoration. Know your limitations, admit them openly and you will gain the respect of everyone. Rush in with a know-it-all attitude and 99.9 percent of the time you will mess up the gun. Needless to say, your reputation will be far from complimentary.

There have been many times when a customer has come to me with a fine gun and requested full restoration, with no limit on charges. I performed only the work I knew I could do correctly and absolutely refused to touch the other requirements; although I recommended other gunsmiths who specialize in those fields and whose work I knew personally. Sometimes it may have taken three or more specialists, but the gun eventually was restored correctly and the customer became a walking advertisement.

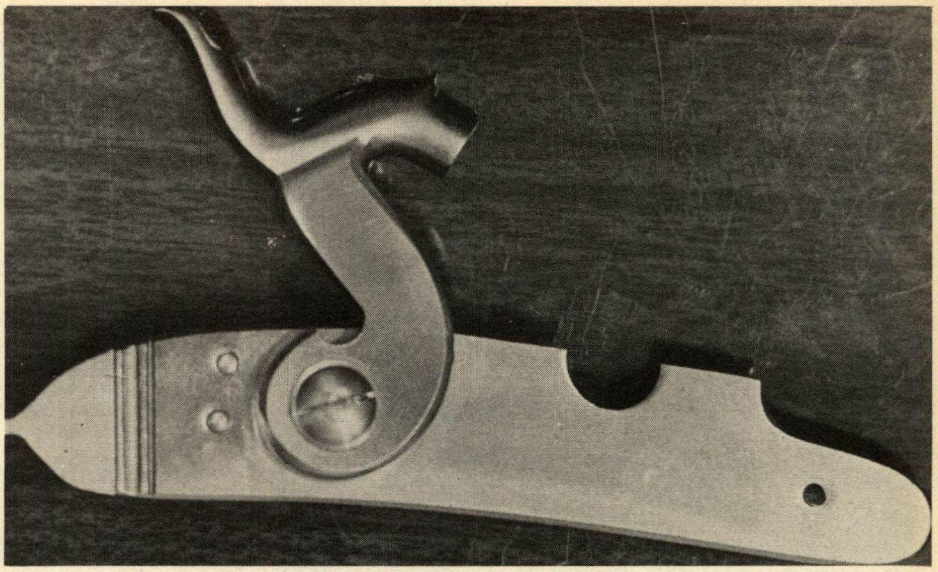
Each gun to be restored is a separate case. There may have been similar situations, but never exactly the same. Each is a full-custom, one-of-a-kind job. However, unlike a new custom gun being created, the gunsmith must re-create following the style of the originator.

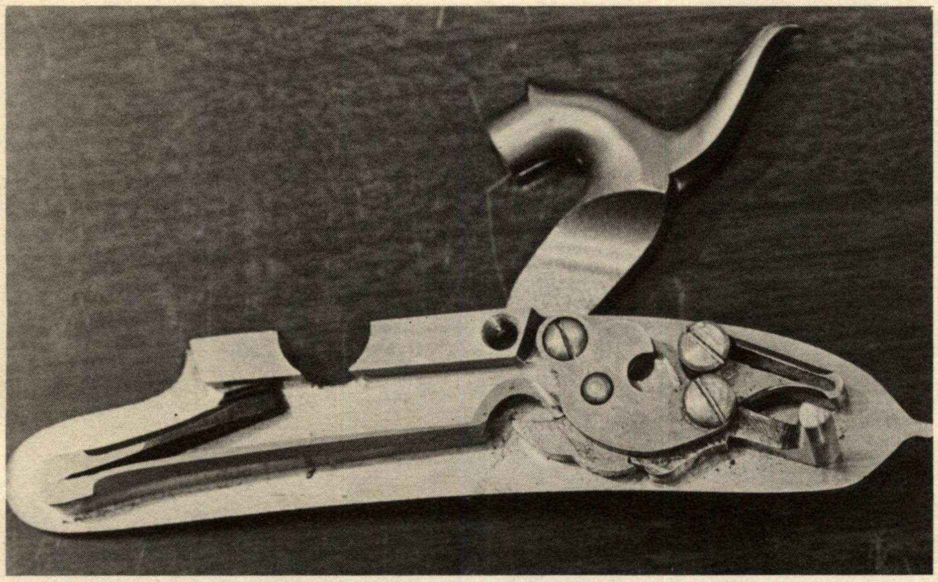
While there are no firm rules in restoration, there are some basic, but loose, categories or phases. Only the gunsmith can determine which group or phase a specific



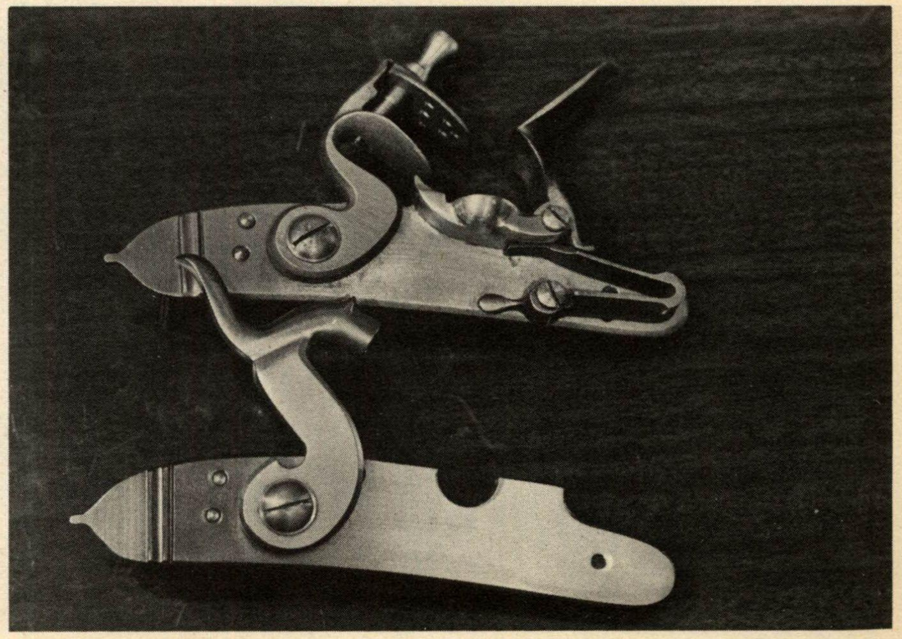
*Left side of flintlock shows Italy as country of manufacture.*

Percussion lock shows common shape of flintlock, opposite.

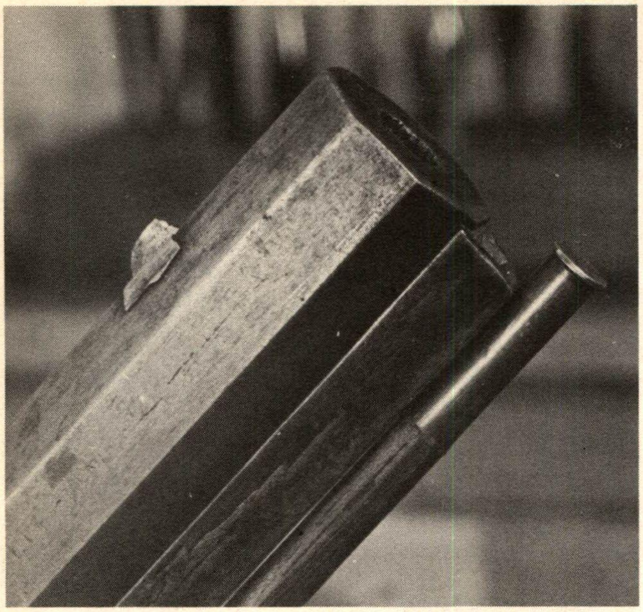




Left side of percussion lock.



Viewed together, both the flintlock and percussion lock show a similarity of shape and quality.



*This is an example of a fine, old muzzleloader that was incorrectly restored. Note that an empty .22 case was used on end of ramrod.*

gun falls into and, thus, plan what steps are to be taken in the restoration.

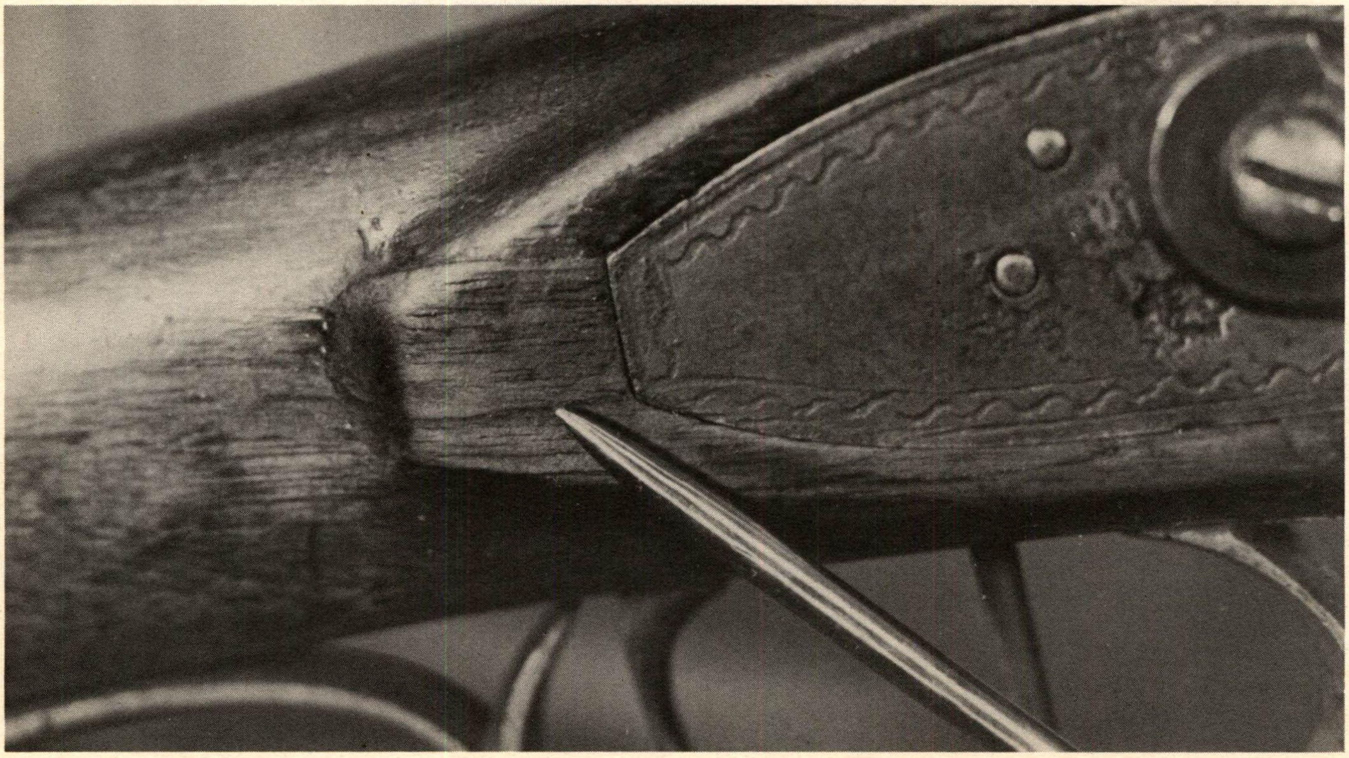
There is one wild card in the game, and it has nothing to do with skill or technique. It is the historical or personal attachment to a specific gun. For example, the derringer that was used to assassinate President Lincoln has a missing screw and a small chip of wood missing from the stock. To replace the screw and repair the stock would diminish the historical significance of the gun. The correct procedure in such a case is to prevent deterioration of the gun, while preserving its original state.

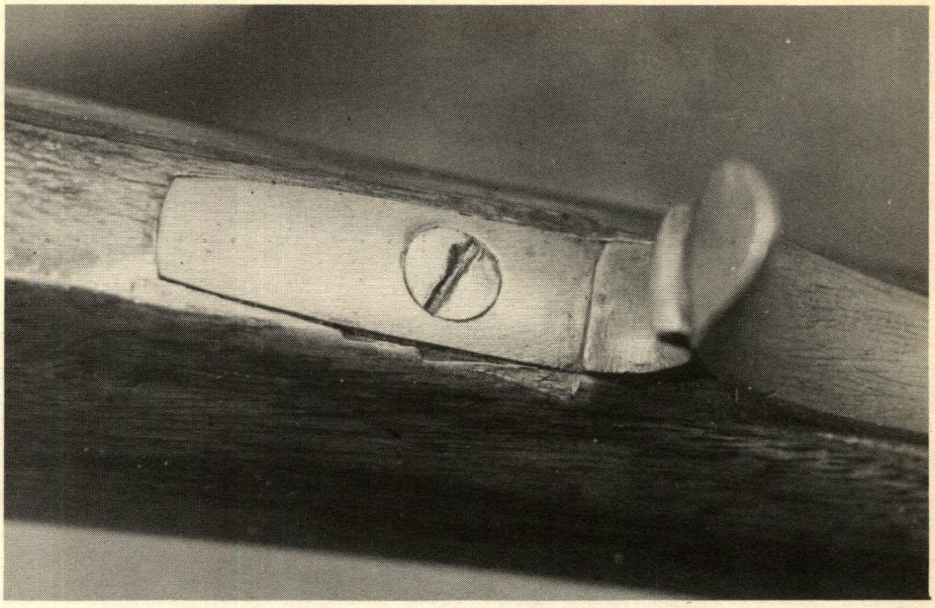
On a lower level, but following the same thought, I have a friend who owns a single-barrel shotgun made around 1800. The gun has been converted from flintlock to percussion and, sometime in the past, the butt stock was slightly burned. It is well worn, indicating use over many years. The gun could easily be reconverted to flintlock, the wood could be restored and the metal could be totally reworked; but this would be wrong as the gun has been passed down from one generation to another in his family. The correct restoration is to halt deterioration, preserve its current appearance, and not rework the gun to shooting condition.

Before any restoration, the gunsmith must determine if there is any historical or personal attachment involved with the gun. If neither is involved, there is a greater latitude in restoration. The only limiting factor is that an original antique should not be restored so as to look like it is brand new. The impression after restoration, simply or fully rebuilt, always should be that of a used, but well-preserved and maintained gun.

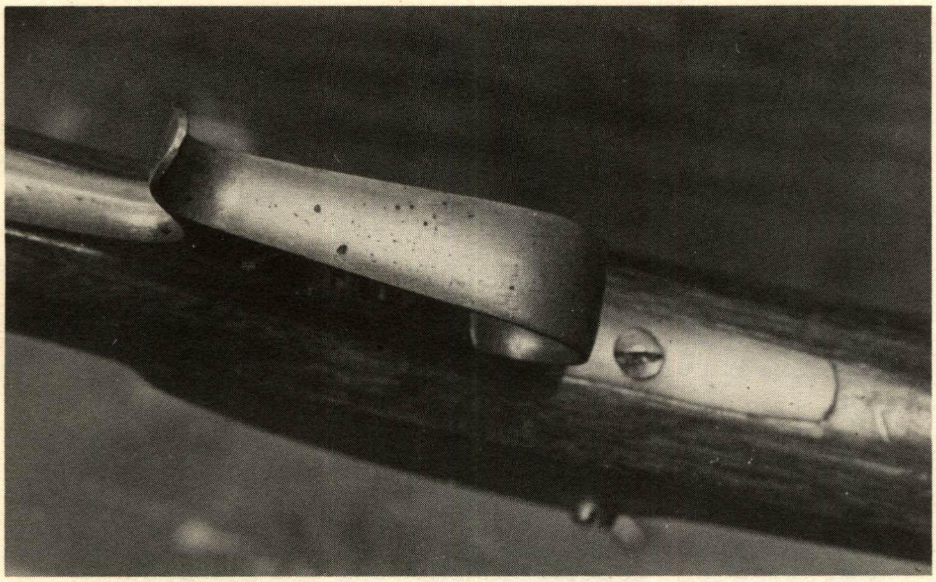
The second and also necessary factor to be determined is whether the gun is to be restored as a collector item or for shooting. Safety must take first priority in this decision. Many times an original gun will have the outward appearance of being in good condition, but will have internal defects that make it unsafe to fire – with even a blank load. The black powder gunsmith must be absolutely certain that a gun restored to shooting condition is safe. Test firing must begin with the lightest possible load, and slightly increased until several heavy charges have been used

*Pointer indicates an old repair job at rear of lock plate. This repair was well enough done and the decision to leave it as is or replace with a new insert is left up to the owner. Either is correct.*





*One of the easiest things to botch up on any gun is the screw slot. Depending on historical value of gun, screw may be replaced, filed and slot recut, or carefully welded and the slot restored.*



*In the case of pits in this old trigger guard, no attempt should be made to fill in and smooth metal. Pits are result of old casting with original air holes.*

and the gun checked thoroughly after each shot. Testing should be conducted using a thirty-foot string, one end tied around the trigger and you on the other end. Only when it has passed the heavy charge tests and inspection should it be fired by hand. If you are not willing to fire the gun yourself, you have no moral right to return it to the owner and state that it is safe to fire.

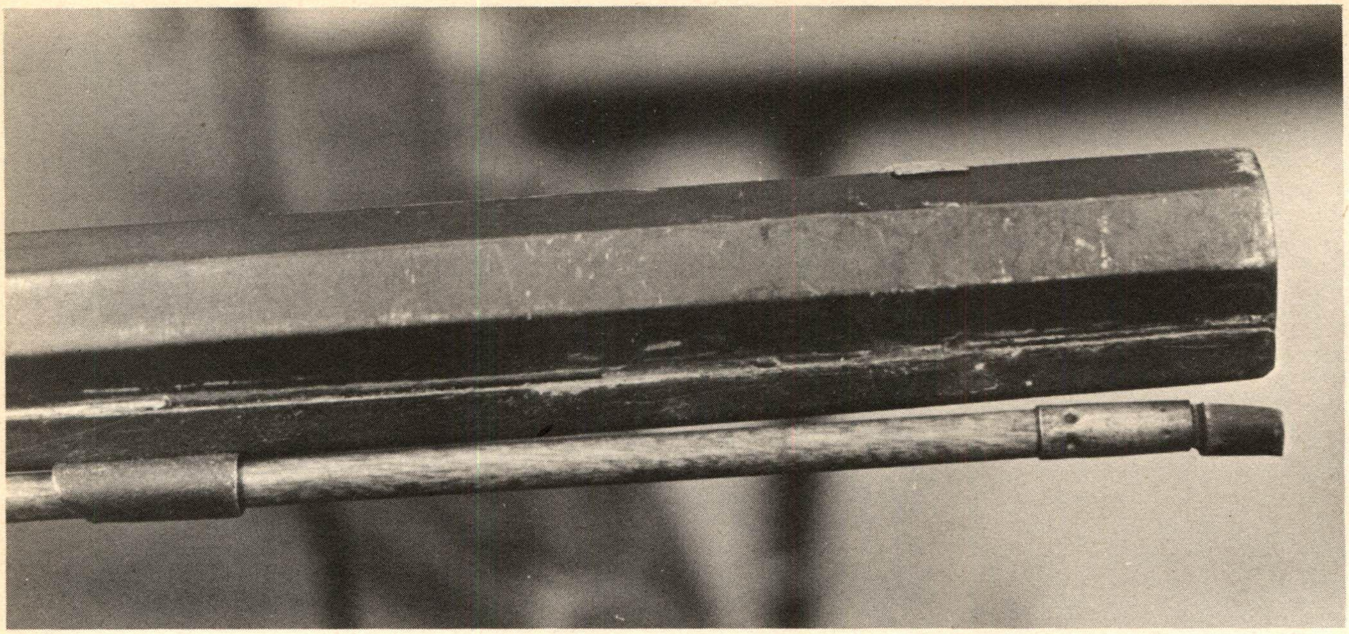
If the gun is restored as a collector item, take one precaution. Have the owner sign a written statement that he is fully aware that the gun is restored as a collector item only, and it is not safe to fire. File this statement and advise the owner that should he decide to sell the gun, he would be wise to obtain a similar statement from the new owner.

Restoration of guns in this category or group can take many forms and should be reserved for a fully qualified black powder gunsmith. The beginner will be wise to turn the job over to such a gunsmith or, at the very minimum, perform the work under his supervision. It is definitely not a beginner's training ground! So how do you learn the art of restoration? There are two ways: the first is by building a series of black powder kits.

If money is an object – black powder kits do not grow on trees – the solution is simple: build them for the experience gained and sell them. Every kit you build will increase your knowledge and skill. Without exception, a modern kit is less expensive than a similar factory-finished gun; but if correctly done, is more valuable than the factory version. Therefore, when sold, you can buy another kit and use the profit to pay for additional tools and equipment.

Even if the finished kit is sold for the same price as a factory version, there will still be a profit for your labor. Even should the finished product sell for only the cost of the kit you still have profitted in knowledge and skill.

Why should you build three or four kits of the identical model and not earn a dime? Well, if you wish to become a craftsman, each of the kits should be assembled with every effort made to turn out a finished product superior to the previous kit. If you follow this procedure and take pride in



*Botched restoration job includes exposed excess solder in some places and complete gaps in others. Unless historically significant, ramrod tip should be replaced.*

*This old gun was rescued from scrap heap. Use as a shooter would be doubtful from safety standpoint. Could be restored to be placed in a collection.*

each job, people will automatically bring kits to you for building with added personal touches. They want something different from the next fellow. At this point you are starting up the rungs of the ladder toward custom gunsmithing.

It is just a matter of time, as your reputation grows, before a modern reproduction will be brought to you with a malfunction or in need of refinishing. This is the first restoration. Sure, it's a modern reproduction, but it requires restoration, not building a kit. The knowledge and skill derived from these jobs add to your training for future antique restoration.

Again, it is only a matter of time before someone brings you an original. Even now, go slowly. Confine your work to simple jobs like replacing a nipple or making a replacement ramrod. Keep in mind the principle of readily and openly admitting your limitations. Take one step at a time.

The second way of learning antique restoration is by salvaging guns headed for the junk pile. The majority will not be collector items or shooters, merely wall decorators.

Disregard their value and think of them as a school of practical experience. Even if they do end up as wall decorators, you will have the satisfaction of knowing you have rescued them from the scrap pile where they would be lost forever. Unfortunately, many such guns do end up in a junkyard and are chopped up for scrap. As their number decreases daily, the value of those remaining increases. Add to this the demand by new black powder shooters to just own an original and you begin to understand the steadily increasing price tags.

This type of gun is really the best training ground for professional restoration. Missing parts require a library of catalogs from dealers who specialize in original parts. Sometimes you have to settle for a modern reproduction part. This, in turn, requires artificial aging to make it blend in with the original gun, and more acquired reproduction knowledge.

Some may require a new part filed out of raw material,

the building of a missing patch box, or replacement of a brass or German silver insert. Again, more reproduction skill to add to what you already know.

Wood will be cracked, pieces will be chipped or missing. The cracks have to be carefully glued back together; the missing piece of wood cut from another similar piece of wood with the grain matched; the new piece of wood artificially aged to blend with the original. More steps in reproduction knowledge to add.

Somewhere along the way you will find an original with the potential for full restoration, and not as a wall hanger. The first such gun should be yours, not a customer's gun. Now you have the chance to put all of that knowledge, skill and craftsmanship to practical application. As it is your gun, with the potential of full restoration, it becomes a labor of love!

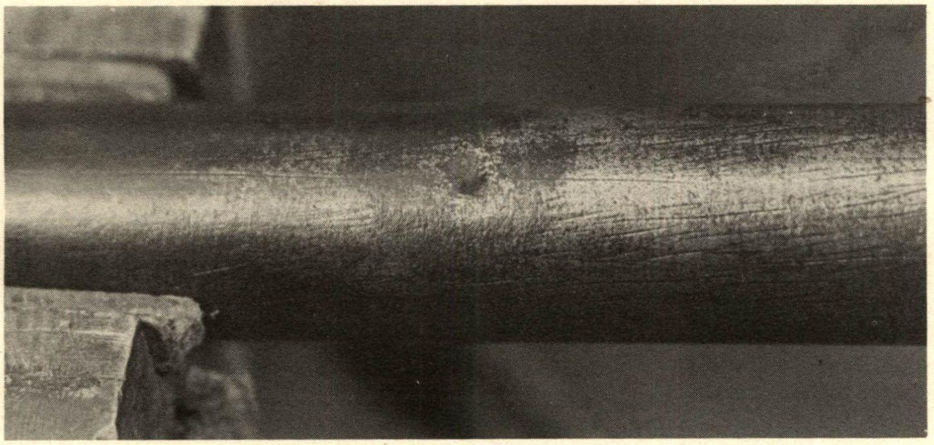
Plan each step carefully. Study every source of parts and components. Above all, work very slowly, with no detail too small for your best efforts. Try to think like the original builder and follow his method, his techniques. In short, re-create yet retain the appearance of a used, but well-preserved and maintained gun.

When the project is finished it will give you a sense of pride and accomplishment that words cannot describe. Even more important, you will understand the feelings of someone else whose gun you will restore!

Custom guns and restoration have much in common, although many black powder gunsmiths prefer to specialize in one field or aspect of each. Actually, this is a wise choice for many reasons. A gun is a composition of many parts and components. If you specialize in one field, your knowledge and skill are concentrated. You can acquire the best of tools and equipment to perform that one segment. In many cases it actually turns into a second profession in a small work area with minimum overhead expense.

Naturally, the more work you do in this field the more you should increase your craftsmanship. You can reach the point where work referred to you for your specific skill will occupy all the available time. I know of several black powder gunsmiths who started this way on a part-time basis and now are full-time specialists with a waiting list of customers.

Regardless of choice, custom guns and restoration are the top of the ladder for black powder gunsmiths, and the only way up is one step at a time!



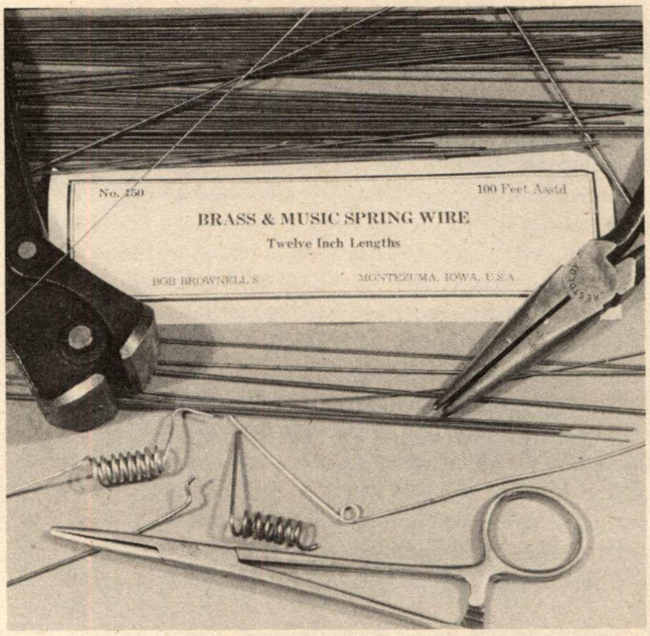
*Dent in old shotgun barrel could be removed, safety is questionable.*

*Broken upper screw head may be removed, new head welded on and artificially aged.*

CHAPTER 18

# THINGS ABOUT SPRINGS

## Or, Taking Some Of The Mystery Out Of The Gunsmith's Secrets



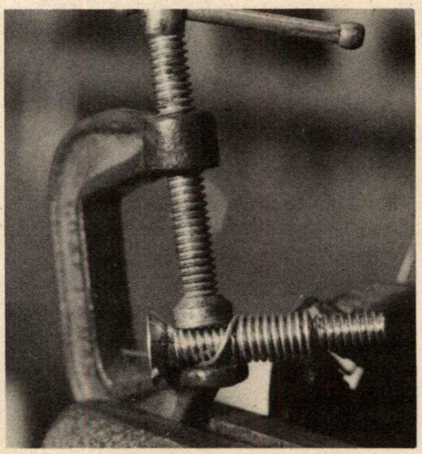

*The basic ingredients for making your own springs may be purchased from any good hardware store or from gunsmith specialty shops such as Bob Brownell's of Iowa*

BROKEN, WEAK OR BENT springs are a common cause of gun malfunction, yet most home gunsmiths seem to think that this is a gunsmithing no-man's land that they dare not enter. They are willing to tackle just about any type of repair job that comes along, but shy away from making gun springs as if they were a plague.

There are probably dozens of reasons for this attitude, but I think the main cause is the mountain of misinformation and half-truths that have been written about gun springs. The plain, simple truth is that gun springs are no more complicated than any other part of a gun's mechanism and, in fact, are less complicated than many of its other components. The secret of any form of gunsmithing, including gun spring making, can be summed up in three words: knowledge, patience and practice.

Many old-time gunsmiths would have the hobbyist believe that the only type of spring steel worth its salt is either Swedish or English. Usually, the only difference between these two is that, in the case of English steel, the Swedish boat captain stopped at an English port for a short beer. Swedish steel is top-notch steel, make no mistake about it. This is mainly due to the high grade of ore found in Sweden, but modern metallurgical technology has overcome the differences in ores. There is little doubt that our current American spring steel is the equal, if not the superior, of any similar steel made anywhere in the world. As a result, there is an abundance of American spring steel available to the home gunsmith at prices that will not ruin the family budget. Most gunsmith supply houses offer spring steel in a multitude of shapes and sizes specifically designed for gun work. Therefore, there no longer is any need for the hobbyist to scrounge through junkyards looking for old wagon springs, clock springs and similar material of undetermined quality.

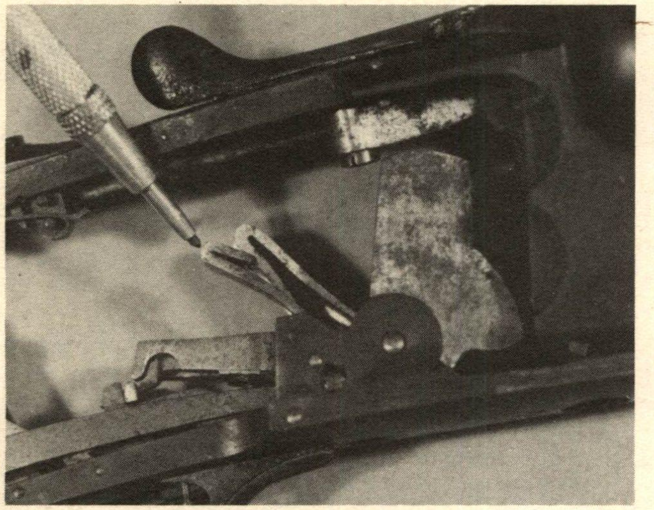
The next supposed stumbling block in the way of the home gunsmith is the vast array of expensive electric ovens and other equipment that is supposed to be necessary. This idea can be dispelled quickly, if one will stop and think for a moment. The gunsmiths of yesteryear had little of today's equipment; in fact, their tools and equipment usually were inferior to that found in most home workshops of today. Nevertheless, they turned out gun springs of the highest quality, many of which still are doing a day's work in antique guns that black powder buffs so dearly love to shoot. As an additional point of emphasis, most of today's professional gun shops are not equipped with a mass of



*Winding a coil spring can be done with a coarse-thread bolt as spacer.*

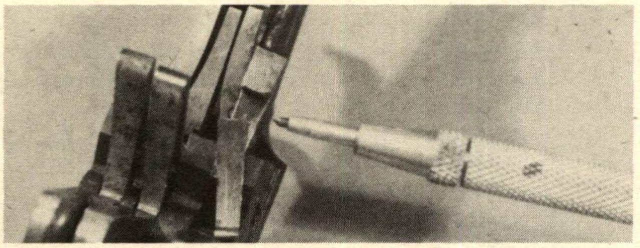
expensive spring-making equipment; still, they turn out replacement gun springs as the need arises.

The majority of modern guns employ coil springs that offer several advantages over the old flat, leaf springs. Mainly, they are less expensive to make, as they lend themselves to automatic manufacture with little or no handwork involved. They usually are made from round wire stock and the thickness of the wire, the diameter of the coil and the number of coils per inch can be engineered to a fine degree for precision function. Factory replacements are available in many cases and always should be chosen whenever possible by the home gunsmith. These factory replacements are, without exception, superior to anything that can be made in the home workshop. However, there will come a time when a factory replacement will not be available and the home gunsmith will be faced with the problem of making his own.



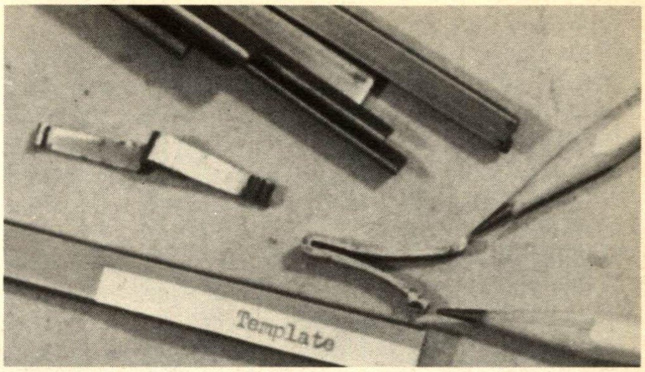
*The problem in this case involves repair of a classic Sauer drilling, suffering from a broken mainspring.*

*Pointer indicates the drilling's problem, broken spring.*



Most gunsmith supply houses offer twelve-inch lengths of pre-wound coil springs in various sizes of wire and coils per inch. Making a replacement spring from one of these consists of selecting the spring to match the original, cutting to correct length and polishing the ends before installing the spring in the gun. The only equipment necessary is a good pair of wire cutters and a small hand stone. A tube of these inexpensive springs should be a part of any gunsmith's supply of goodies carefully stored away for future use.

In addition, the home gunsmith who makes it a habit to collect any and all coil springs lying around looking for a home is a wise man, for there is no such thing as having too many coil springs on hand in a gunshop. The gunsmith




*Flat spring stock is first laid out for inspection, with replacement template. Special ends at pencils.*

supply houses also offer a wide selection of small packs of pre-wound springs for such specific purposes as extractor springs, firing pin springs, recoil springs, etc. The Wolff Gunspring Company is another source of replacement.

The mousetrap-type gun spring generally is employed in today's guns instead of flat leaf springs, as they also lend themselves more readily to automatic manufacture. Factory replacements generally are available and, in addition to being used in the guns for which they were designed, the home gunsmith sometimes can alter one mousetrap spring to serve a similar need in another model. On several occasions I have made these springs substitute for flat leaf springs that were not capable of getting the job done. Many gunsmiths condemn these springs, usually from a personal opinion standpoint rather than from actual facts. Quite often the mousetrap spring actually is superior mechanically to a flat leaf spring in function.

Regardless of how many replacement coil and mousetrap springs you have on hand, sometimes there is no other choice except to make a replacement spring from scratch. Round spring wire is sometimes known as music wire and is available from many sources in just about any diameter and length desired. The gunsmith supply houses offer twelve-inch length assortments of spring wire at a price of around three dollars per hundred pieces.

However, one thing should be made clear. Most homemade springs will not be as pretty as the factory spring, for the hobbyist probably will make only a few springs each year. The appearance will improve with practice, so don't become discouraged if your first efforts are not works of art. Airplane pilots have a saying that any landing you can walk away from is an acceptable landing. Any spring that functions correctly is an acceptable spring.

For replacement coil springs, select the correct matching diameter wire, then measure the outside diameter of the old coil spring. You will need a small steel mandrel on which to wind the wire and it must be of sufficient diameter to produce a spring of the same outside diameter as the old spring.

You usually will have to make a few short test springs to determine the correct mandrel diameter, due to the expansion of the coil spring when removed from the mandrel. The free end of the wire must be secured to the mandrel. This can be accomplished with either a clamp or by drilling a hole through the mandrel and inserting one end of the wire in the hole. The best way to hold the other

end of the wire is with a pair of vise grip pliers, as considerable pressure must be exerted in the winding.

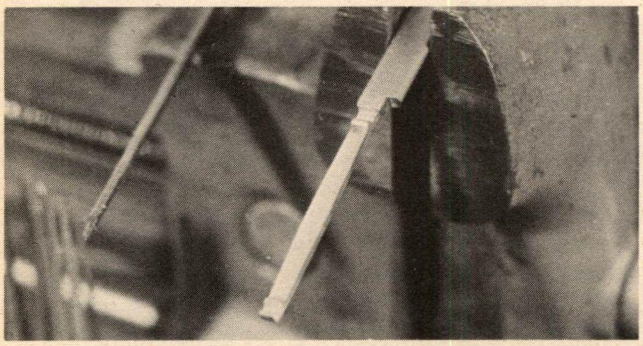
To determine the spacing of the coil, measure the distance between the coils of the old spring and make a small wooden or metal flat gauge of the correct thickness to insert between the coils of the new spring as it is wound. You should subtract about one-eighth of the measured distance again to allow for the expansion when the spring is removed.

With a little practice you can just wind them by eye, using the TLAR (that-looks-about-right) method for spacing. A coarse-threaded bolt also can be used for both a mandrel and to get the desired coil spacing as the spring wire is wound in the threads. It is a good idea always to make a coil spring a wee bit longer than the desired finished spring in order to allow for trimming and polishing of the ends. With most springs, the wire is wound cold, while keeping it pulled tight against the mandrel and not relaxing the pressure. If you have trouble getting the coils against the mandrel, try tapping the wire with a hammer as you wind. The important thing is to go slow, take your time and make each coil as near perfect as you can.

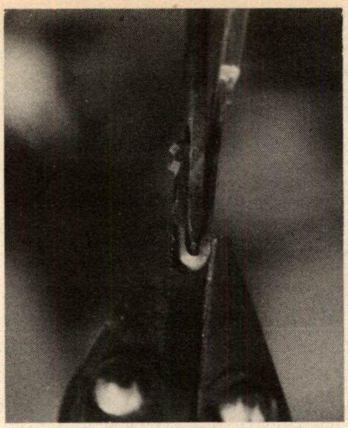
Mousetrap springs are made almost the same way, twisting and bending the wire to the desired shape with pliers. Rods, bits of metal, scrap odds and ends all can be used as forms on which to shape the spring. In the case of both the coil and the mousetrap springs, the majority can be worked cold and will perform their jobs well. Occasionally it is necessary to heat the wire to get it bent into an odd shape or when the wire is of heavy gauge. In these cases, you will have to reharden and temper the wire, which can be done exactly like the flat leaf springs.

The flat leaf springs will require more elbow grease and sweat on your part than the wire springs; but, again, no expensive spring-maker equipment will be necessary. The selection of the flat spring material is most important, and the home gunsmith should use only the spring stock available from gunsmith supply houses. The reason is that many modern springs are designed for machine production, and therefore may contain ingredients or have a heat range that does not lend itself to hand manufacture. The spring stock available from gunsmith supply houses is designed specifically for hand manufacture, which greatly simplifies the hardening and tempering of the finished spring.

After everything is polished slick and smooth, then comes the bending and shaping of the spring to match the original. This will require heat, which can be anything from a welding torch to the kitchen stove. What is important is that the spring be heated only enough to allow it to be bent



*Almost completed spring, still attached to spring stock for handling ease, filed and polished.*



*Spring is bent over wedge jig with pliers, before heating with propane torch.*

to shape and no more. High, excess heat is not necessary; it will only remove carbon from the steel, thereby depleting its strength.

A dull red color usually is sufficient for any bending. Make the bends slowly with pliers, keeping the curves graceful, the limbs even and not twisted. A small metal wedge inserted at the bend is useful to keep the inside limbs even, and will provide a form to help shape the spring.

When bending is completed, allow the spring to cool naturally in its own good time. Lay it over the old spring and make a final check to assure that it matches at every point. If not, you can reheat and make the necessary corrections, even some last minute filing. Any scale that has formed on the spring should be polished away to allow even heating in the next steps.

I doubt if any form of gunsmithing has been more blown out of proportion than hardening and tempering of gun springs! Basically, it is simple. First, the spring must be heated to its critical temperature, then the temperature suddenly dropped in order to set the hardness.

Heating can be done in many ways, but for the sudden temperature drop, quenching is important, as the speed of the temperature change directly affects the hardness of the spring. I have seen everything under the sun recommended as a quenching medium, except moose milk, and I wouldn't be surprised if someone has recommended it.

The main thing to remember is that the thinner and the colder the quenching solution, the harder the spring will be; the thin solution and the cold temperature dissipate the spring's heat quicker than a thick, warm solution.

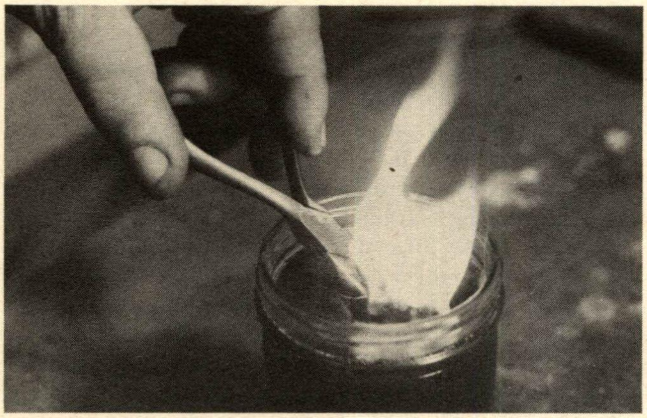
A cold brine solution made from common household salt at about six teaspoonsful per ten ounces of water will produce maximum hardness with most springs. From this, you can eliminate the cold, then the salt and on down the line to boiling water for step-by-step softer springs. For even softer springs you switch to oil. Sperm oil long has been a favorite quenching solution, as has linseed oil. Both of these oils will do a fine job, but are not necessary, as common nondetergent automobile engine oil will do just about the same job. Naturally, the weight or thickness of the oil will affect the spring, but regular thirty-weight oil is about all you will need for springs made from the stock that you buy from gunsmith supply houses.

My grandfather, one of the old-time gunsmiths, taught me how to make springs when I was still a boy in knee pants. His equipment consisted of an old hand-powered forge on the hot coals of which was placed a half-inch thick section of iron plate. When the plate was heated to a dull red, the spring was placed on it carefully and allowed to

absorb heat from the plate.

When the spring reached the same dull red color, it was pushed into the waiting quenching solution. This system works quite well and the home gunsmith can duplicate it by placing an iron or steel plate on the kitchen stove. All that is important is that the heat be transferred evenly. With a little practice, the spring can be heated with a hand-held propane torch, but care must be taken to keep the spring moving while it is being heated to prevent the thinner limbs from overheating.

Watch for that dull red color on all parts and immediately dunk it into the oil and swish it around rapidly. Allow the spring to cool completely before removing it from the oil; otherwise, you will alter the rate of temperature drop which, in turn, will alter the hardness of the spring.



*When spring has been heated to proper shade of red, as described in text, it is plunged into quenching oil.*

Let's assume that you have a broken flat leaf spring and cannot find a replacement. The first move is to measure the remains of the old spring, specifically its length, width and thickness. Also look closely at the tapered limbs and the ends of the spring, noting any special hooks, eyelets or loops. A short piece of typing paper cut to a width and length the same as the original spring can be used as a template to transfer these dimensions to the blank spring stock.

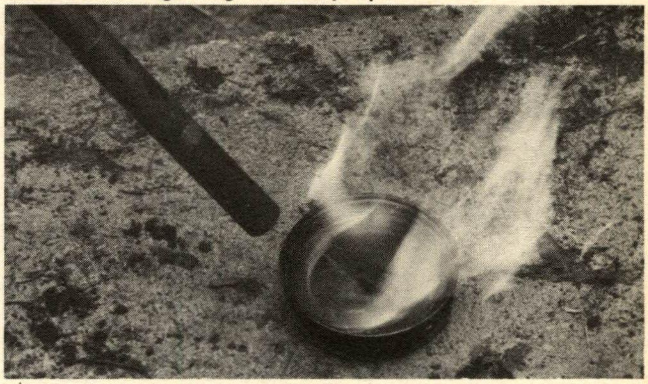
When cutting this template allow 1/32-inch extra width and about one-fourth inch extra length for final shaping of the spring. Select the spring steel stock for thickness sufficient to slightly exceed the thickest part of the original spring, taking into consideration the spring's ends, hooks and other special sections. Generally, all you will need is a good hacksaw to cut the blank from the spring stock, as these strips are in the soft state. It is best to leave one end of the blank attached to the spring stock for ease of handling while the spring is being filed to shape.

Square up the blank with a file and mark the exact center where you will make the bend in the finished spring, and also lay out any hooks or other parts that will require either bending or special filing. The center section usually is the thickest part of the spring and adds strength, while the thinner limbs gives the spring its quick whip-like action. Therefore, the taper from the thick center section to the thinner limbs must be filed carefully, keeping the reduction in thickness smooth and continuous without humps or bumps. Take measurements carefully and constantly with a micrometer or calipers.

In the event you do not have these tools, you can cut several thickness gauges out of cardboard and use these to keep the reduction constant and matching the old spring. After the initial roughing out of the spring, make all of your file strokes the length of the spring rather than across it. This will maintain the even reduction in thickness and eliminate any cross scratches from the file. When the spring has been shaped fully, wrap fine grit aluminum oxide cloth around the file and thoroughly polish the spring lengthwise on all sides. Every scratch must be removed, as they will hamper even tempering and the spring will have a tendency to break at such marks.

The spring is now hard and brittle. Any attempt to compress it will result in a broken spring. This hardness must be drawn or tempered sufficiently to allow the spring to lose the brittleness, yet retain the springy quality. There are two basic ways to do this in a home workshop. One is by flashing, which consists of dipping the spring in oil, igniting the oil and allowing it to burn or flash. The only problem is in determining the number of flashes required, which usually has to be done by trial and error on a test piece of spring. Most small, thin springs will require only one flash, but the larger and thicker springs will require up to five or six flashes.

*Tempering is done by immersing spring in small metal container and igniting oil with propane torch.*



My grandfather's method consisted of dropping the hardened spring into a small metal container just large enough to hold the spring, adding oil until it covered the spring. The iron plate was heated up again over the forge and the container with its oil and spring was placed on the plate. When the oil started to boil it was ignited with a match and the container removed from the plate. After the oil completely consumed itself, the spring was allowed to cool naturally.

The home gunsmith can duplicate this same method on the kitchen stove or, if he prefers, he can burn the oil until it is consumed, down to the last drop. The spring, after cooling, is polished to remove the burnt oil and scale before being installed in the gun.

This system is as old as the hills, but still works, and I have yet to find a better or simpler method. Naturally, a thermostat-controlled electric furnace is less messy and more technically correct, but few home workshops can afford such equipment and what is important is that the spring works.

Quite often, old springs that have lost their power can be heated, reshaped, then hardened and tempered in this same manner to restore them to service.

# COLOR CASE-HARDENING SIMPLIFIED

## This Process Has Been Surrounded By Mystery, But It's Not All That Tough To Accomplish

### *CHAPTER 19*

GUNSMITHING, LIKE MANY other forms of craftsmanship, has many supposed dark, secret and mysterious processes that are not for the eyes and ears of the uninitiated. Everybody loves a good mystery, so the uninvited build the story even bigger, until the simple truth becomes myth.

Such is the gunsmith's process of case hardening, only this time the story has had a lot of help over quite a few years; several hundred centuries to be exact, all the way back to the end of the Bronze Age. The use of bronze, a mixture of tin, copper and traces of other elements, had been the first of man's metals that released him from dependence upon stone for his implements of war and commerce. Exactly when the Bronze Age began has been lost to history and its demise was not an abrupt end, but a slow and gradual process.

Metallic iron in the free state exists only in a few places in the world, not counting a meteorite or two found here and there. However, iron ore is the fourth most common element on earth and exists in a wide variety of types, usually in combination with sulphur and other elements. Exactly when man first began to make iron also is lost in time, with the oldest example consisting of a few iron beads found in Egypt dating back to 4000 B.C. The Egyptians called it the "metal of heaven," probably because of its superiority over bronze.

The Greeks are known to have made implements at approximately 1000 B.C., and most archaeologists credit Egypt with widespread use of iron tools and war implements in 3000 B.C. The superiority of iron weapons over bronze created a demand that undoubtedly inspired the early iron workers to rapidly perfect their trade. Oddly enough, the same original basic process was used up until the Fourteenth Century.

Wrought iron was an early form. The process consisted of heating iron ore over a furnace of charcoal until it became a spongy mass. This was removed from the fire and repeatedly struck with hammers to drive out the slag and other impurities, as well as to compress the mass. The end result, after several heatings and hammerings, was a basic

soft iron with about three percent slag remaining, as well as about one percent of other various impurities. In this form, the wrought iron was heated again and, with repeated hammer blows, forged into useful tools, weapons and other implements.

The early iron workers noticed that one batch of wrought iron sometimes was much stronger and tougher than the others, usually the result of a batch requiring more than the usual number of heating and hammering operations. Accidentally, they had discovered a simple form of basic mild steel, which consisted of iron with the addition of the element carbon. During the heating, carbon gas was liberated from the burning charcoal and impregnated and fused with the mass of iron near its critical temperature.

The recognition that anything containing carbon could be utilized to strengthen the wrought iron could be termed the beginning of the Steel Age. Hundreds of experiments in a thousand different locations finally resulted in a controlled process to produce steel. However, it soon was learned that the amount of carbon absorbed by iron is severely limited from a practical standpoint. Iron with more than 1.4 percent carbon content tends to be quite brittle and of little use. Common mild steel contains about .05 percent carbon, spring steel is approximately .90 percent carbon content, and files contain 1.20 percent carbon. The carbon content of steel is rated as so many points, with one percent being one hundred points, .40 percent is forty points, and so forth.

Early gunsmiths were, of necessity, thoroughly trained iron workers, hence the beginning of the supposed deep and mysterious process of their use of controlled carbon hardening of iron, commonly referred to as case hardening when the carbon is concentrated on the outside of the iron part.

The hobby gunsmith who understands the simple principle of case hardening and how to achieve it will find hundreds of uses for it in gunsmithing. Thankfully, the old and elaborate preparations no longer are necessary, nor are the methods of application beyond even the most modestly equipped home gunshop.

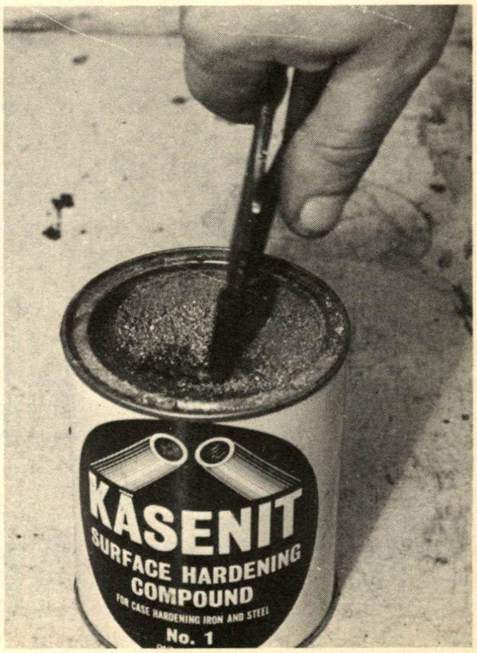
The gunsmiths of yesteryear used numerous substances as sources of carbon: charred leather, animal bone dust, sodium carbonate, rosin; just about everything except elephant teeth and somebody probably tried this. The ingredients were enclosed in an iron box, the part to be case hardened inserted and more of the ingredients added around and over the part. The iron box then was heated to a dull red color for several hours. The box was removed from the fire and the ingredients quickly dumped into clean water.

After the fog lifted and everybody's sinuses had cleared, the part was removed from the water. The outside surface now was extremely hard and more wear resistant than the best grade of tool steel. This system of case hardening is commonly termed pack hardening or pack carburizing. While the old witches' brew carbon concoctions are no longer necessary, pack hardening is still of use to the gunsmith when large parts are to be processed or a deep case is desired. The only variation is the use of modern case-hardening compounds that assure consistent results.

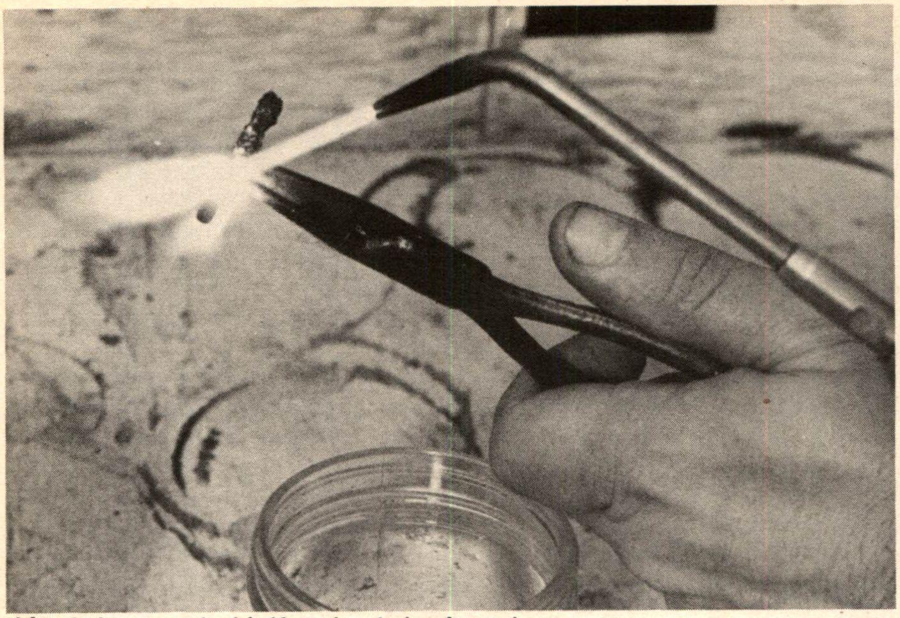
The technical term for case hardening, carburizing, or the old term of chilled steel, is cementation ($Fe_3C$). As the term implies, a tough and hard outer skin or case of carbon is cemented to a soft inner core of iron or mild steel. The depth of the case is thin, usually no more than one-eighth inch maximum and generally less. However thin, this case is the finest of close-grained steel and highly resistant to wear, strain, impact and rusting. While these properties alone would make the process useful, the greatest advantage is that it can be applied to easily machined, inexpensive common cold roll iron or steel that otherwise would be useless as a gun part. Difficult-to-shape parts can be stamped, forged, rolled, bent or otherwise shaped, then case hardened to provide wear-resistant surfaces.

Beside pack hardening, there are several other simple methods of case hardening that can be utilized in gunsmithing. Any gas that contains an abundance of

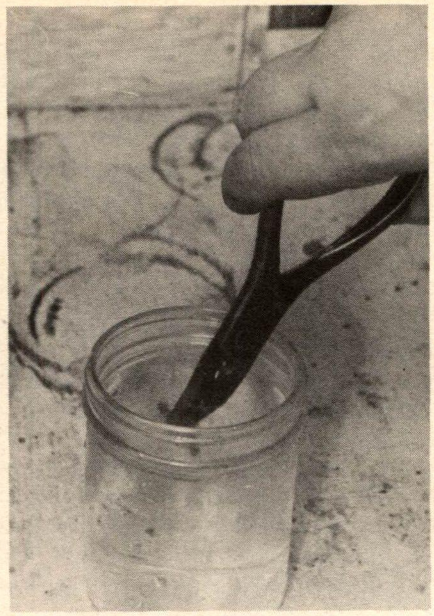

*Left: Using oxy-acetylene torch, replacement gun pin is heated to proper temperature for hardening.*




*Right: Sufficiently heated, pin is plunged into can of hardening compound and rolled. Kasenit melts and forms glass-like casing.*



*After being coated with Kasenit, pin is reheated with torch. All surplus Kasenit will burn off.*



*Pin is again reheated to proper stage, according to text, and immersed in cool, clear water.*

carbon, such as the acetylene in a regular oxy-acetylene welding torch, can be used for light case hardening. Acetylene gas is obtained from carbide and, if burned by itself, produces a thick and sooty carbon smoke. The addition of oxygen increases the rate of burning of the acetylene in normal welding and eliminates the sooty carbon smoke in what is termed a neutral flame. By decreasing the amount of oxygen fed to the torch mixture chamber, the flame is rich in carbon which is deposited on the metal being heated; in effect, a carburizing flame.

After the part reaches a dull red color, the torch is removed and the part quickly quenched in cold water. The result is a light case hardening of the surface of the part. This can be repeated a second time, bringing the color to a deeper yellow-red, then a quick quench. This is about the maximum case hardening that can be obtained this way, as additional heating or a brighter color will result in oxidation of the surface of the part and defeat the purpose. It is a useful trick for such small parts as pins, screws, etc. I have used this type of case hardening many times; usually when I have found a gun screw that is on the soft side and to be used in a nonessential place. Screws treated this way will resist burring of the slot the next time a screwdriver is applied to them, and a nonessential pin will resist bending or battering. A common, hand-held propane torch can be used for this procedure, but the results are not quite as good, insofar as the air-to-propane mixture is fixed and cannot be adjusted.

Liquid carburizing is the type of case hardening used to produce that beautiful color case hardening of receivers, frames, etc. In this, sodium cyanide is heated in a pot to about 1550 degrees Fahrenheit, at which point it becomes molten and turns a bright red color with the thickness of lightweight oil. The part to be processed is first heated in an oven at around 1200 degrees to remove all traces of moisture. This is important, for if moisture is present when the part is immersed into the molten cyanide, this will result in a violent and dangerous eruption.

The operator, using a long iron rod with a hook on the end, removes the part from the oven and slowly lowers it into the pot of molten cyanide. Around fifteen minutes immersion is maximum and will produce a case about .005 inches thick. The part is removed with the long iron hook and quenched in a series of dipping motions in a solution generally containing water, saltpeter and light oil, all of which is agitated with air being released at the bottom of the quenching tank. It is the skill of the operator in the series of dipping motions into the quenching tank, plus the agitated solution, that produces the waves of mottled color on the part.

Cyanide is one of the most dangerous chemicals in existence. Only a few grains entering the body, even through a cut, will result in almost instant death. Any form of acid, no matter how mild, mixed with cyanide produces cyanatic gas. This is the gas that made the execution gas chambers so effective. One whiff and you are off to the happy hunting grounds. When used in gunsmithing as described, it is always under close safety precautions and with strong exhaust fans over the pot and quenching tanks. Personally, I would rather try to brush a rattlesnake's teeth with one hand tied behind me than work with cyanide in any form.

Disregarding the beautiful colors, the actual case is thin and there are much safer methods that are easier to use and which produce a better case. While there are numerous home brew concoctions that are supposed to produce color case hardening without cyanide, I have yet to find one that will give decent colors consistently. Those that do work always contain cyanide in some form. I recommend that anyone wanting a frame or receiver color case hardened should farm out the job to a company that is equipped to do the work safely. It is definitely not a do-it-yourself project!

For the gunsmith – hobbyist or professional – there are several good commercial case hardening compounds available that will produce a deep case in complete safety.

Almost any well-equipped welding supply house carries several brands. Quicklight-A, produced by E.F. Houghton & Company of Philadelphia, Pennsylvania, is a good example. This compound is designed primarily for production work and gives a good, uniform case when used in the pack-hardening type of application. When heated in an oven at 1800 degrees for twelve hours, it will produce a thick .140-inch depth case. Less time and temperature, such as one hour at 1750 degrees, will produce a .030-inch depth case.

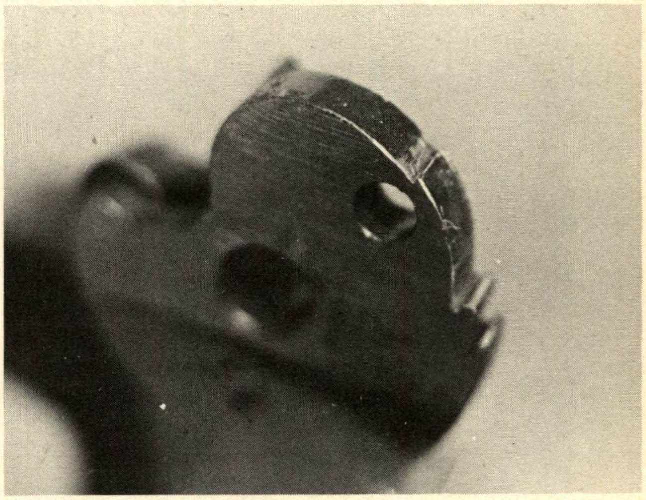
Probably the most versatile compound, and the one used in most gun shops, is Kasenit Number One, produced by the Kasenit Company of Mahwah, New Jersey. This is available from these gunsmith supply houses: Frank Mittermeir, Incorporated, Bronx, New York 10465; Brownell's Incorporated, Montezuma, Iowa 50171; Dixie Gun Works, Union City, Tennessee 38261; and Alley Supply Company, Gardnerville, Nevada 89410. A one pound can should last for a year.

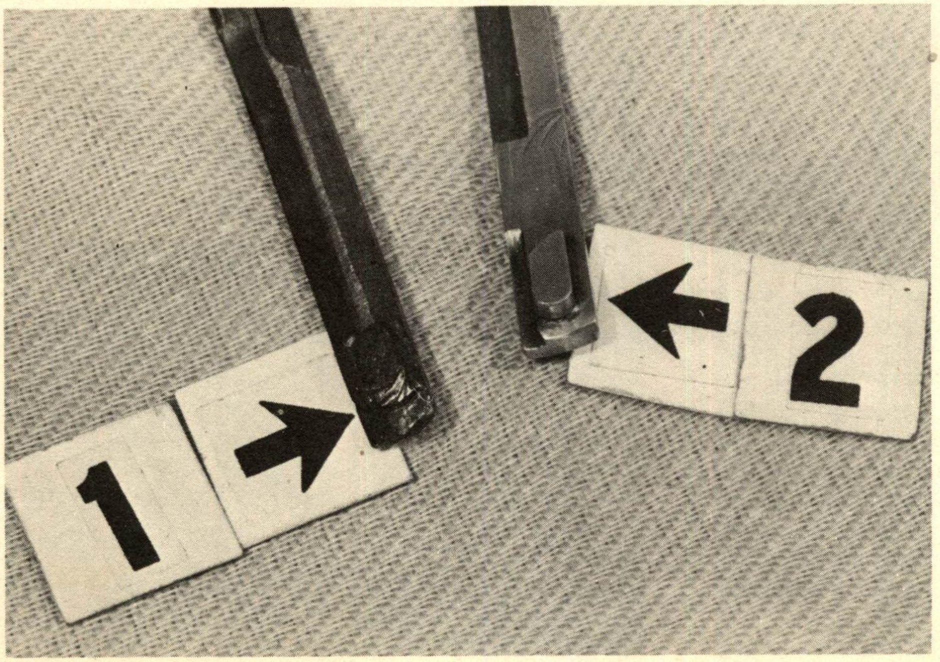
Kasenit is nonpoisonous, nonflammable and nonexplosive. It can be used in a variety of ways on mild steel, tool steel, mild iron, cast iron, wrought iron and malleable iron with excellent consistent results. Like all case hardening compounds, it is less effective on steels that contain nickel, chrome or molybdenum, but will produce a case on these steels with the depth in direct ratio to the contents of the alloyed steel.

Perhaps the most attractive feature is that it can be used with virtually any type of heat source capable of producing 1700 degrees Fahrenheit and no fancy equipment is necessary. The gunsmithing use of Kasenit is almost unlimited and the more you use it, the more different uses you will find for it in either the home or professional gunshop. As an example, many guns that have seen a lot of use or were inexpensively made originally will have pins that are worn or bent. Trigger pins, sear pins, hammer pins and component pins are just a few examples. The replacement pin can be made from good drill rod steel and correctly hardened as in the normal procedure. However, the correct diameter pin is not always available in drill rod sizes or one is sans machining facilities. Mild cold roll steel or iron rod can be substituted provided it is case hardened. Even if drill rod is used, it can be improved by case hardening. A pin produced either way is glass hard and will resist wear for a long time, even without proper lubrication.

Other common trouble parts are the many soft screws found in guns, especially in some of the inexpensive imports. They burr when a screwdriver is applied to them or the threads shear under pressure. This is especially true on many imported scope mount and base screws, which require firm seating to hold a scope securely. Either the original screw or a replacement can be case hardened easily with Kasenit. A quick and simple hardness test for pins and screws is to try a good file across the end. If the file will cut the part, it is too soft.

Many guns are not safe, because someone has ground or stoned the hammer or trigger sear notch down to base metal, and a reshaped correct angle simply will not hold after a few shots. These, and sears that have been chipped, can be case hardened after reshaping and finished up with light polishing to remove any lingering rough spots. Pin






*Above: Hammer with sears recut incorrectly down to base metal, allowing hammer to slip. Notches may be cut and rehardened. Gun parts such as No. 1, left, burr due to softness. By reshaping and hardening, parts can be restored to appear as No. 2.*

holes in hammers, triggers or sears often become worn and will not engage properly. This can be corrected by drilling the hole larger in both the part and the frame to accept a new and larger diameter pin. The new hole and pin, after case hardening, will place many otherwise useless guns back into safe service. Parts that are worn and will not align for proper function can be built up with common welding rod, filed and dressed to shape, then case hardened to assure long wear life. This should not be done, of course, on any part that in any way contains the pressure in the chamber. These are but a few ways that Kasenit can solve everyday gunsmithing problems.

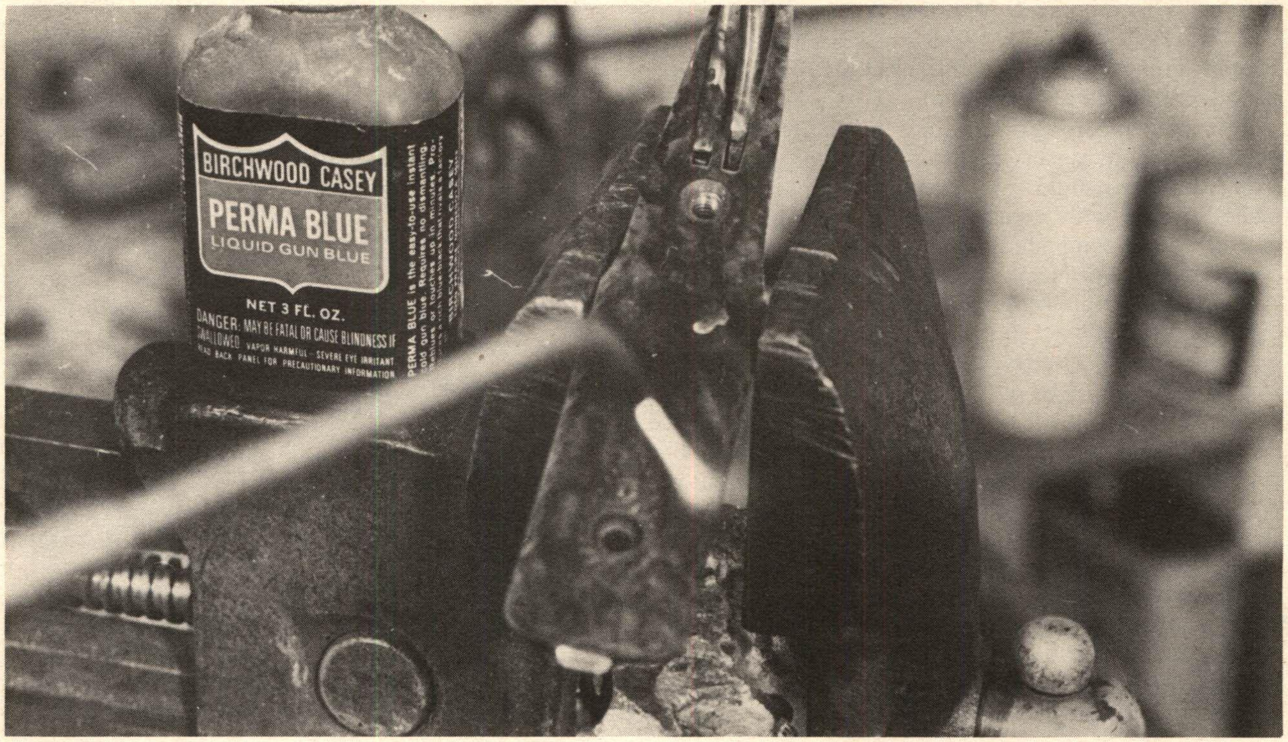
Let's assume that you have a part, such as a hammer pin made from mild steel, that you want to case harden. The first thing is to check the part with the gun assembled to assure correct function. This generally is referred to as soft fitting. Remove the part and check that it is highly polished. Holding the pin in the jaws of a cheap pair of needle nose pliers, heat the part to a bright red color – which is around 1650 degrees – then quickly dip and roll the pin in the Kasenit compound. The compound will melt and form a fused, glass-like shell around the pin.

Next, reheat the part with your torch or other heat source. A bright yellow color will form at first, which should be ignored, as it is simply excess compound being metaled and fused to the part. As the bright yellow disappears, continue to apply heat to the part, bringing it to the bright red color again. Now quickly quench it in cold, clean water, swishing the part around to assure uniform cooling. Remove the part and it will have a nice gray color. A quick test with the file will produce a squeaking sound, but the file will not cut the case hardened part. If a deeper case is desired, repeat the operation a second time. Two times is about maximum with this method, and is generally sufficient.

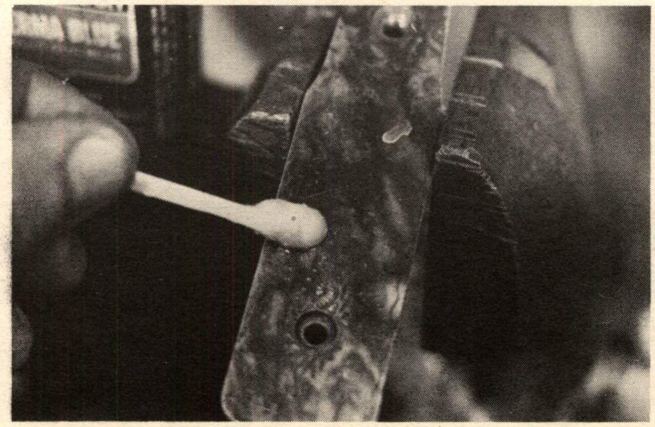
The same procedure can be used on tool steel, except the color should be a bright yellow, approximately 1700 degrees, on both the initial and quenching heat. High-carbon steel may become too brittle using cold water, so light oil should be substituted as the quenching solution.

Quenching solutions can be made to suit the gunsmith's needs by remembering two simple rules: First, the colder the quenching solution, the harder the part; consequently the warmer the solution, the less hardness. Second, the thinner the solution the harder the part, and the thicker the solution, the less hard. A few tablespoons of common salt in a glass of water to form a brine quenching solution, then chilling this solution, will produce maximum hardness.

Substituting oil for water as a quenching solution really only provides a thicker solution. It is simply a matter of




*Possible cyanide poisoning may be avoided during color case-hardening process by using gun blue and oxy-acetylene torch and following text instructions. Below, plenty of practice is required to come up with yellows, reds and bronzes using mixture of gun blue and tincture of benzoin, with correct heating.*



how rapidly the heat from the part is absorbed by the solution. The quicker the heat is absorbed, the harder the part.

The fused compound usually will fall away from the part when it is quenched. If any remains, a light tap with a piece of metal should make it break away. Excess scale can be eliminated by making the solution one part caustic soda to ten parts water. If heavy scale results, soak the part for two or three minutes in a solution of one part sulphuric acid to two parts water. However, neither of these cleaning solutions are normally necessary with Kasenit and medium-size parts.

Kasenit also can be used like molten cyanide to produce a maximum depth case, especially on large parts. It will not produce color case hardening, but on the other hand is not poisonous like cyanide. A crucible is used to hold the Kasenit compound and heat is applied until the Kasenit becomes molten at about 1650 degrees. Remember that the part to be case hardened must be absolutely free of moisture to avoid spattering when immersed in the molten Kasenit. Use your torch to preheat the part or place it in an oven of some type at 300 degrees or better to remove the moisture. Use a long rod to lower the part into the molten compound and allow it to remain for a minimum of fifteen minutes on up to sixty minutes, depending on the depth of case desired. The part is then removed and quickly quenched.

The use of molten Kasenit allows large parts to receive a consistent case depth on all areas and is useful on a multitude of parts, components and tools. Things like reloading dies, bullet moulds, bullet cutting cherries or large gun parts made from mild steel are but a few examples. Dixie Gun Works recommends Kasenit to harden the frizzens on their flintlock gun kits, a part that receives constant pressure.

If a case hardened part will require bluing, it may be necessary to surface draw the part slightly to allow the bluing chemicals to react to the metal. This is done by placing the part in a common kitchen oven at about 400 degrees for ten or fifteen minutes, then allowing the part to cool normally. This will draw the surface case for a shallow depth, but the main case will remain.

Another trick is that one section of a part can be case hardened while the other remains normal by simply rotating the section to remain normal. This can be accomplished easily by either dipping or painting the section to remain normal with copper sulfate. The copper-plated section will prevent the case hardening compound from being absorbed into the metal underneath. After the case hardening operation is completed, the copper sulfate-plated section can be buffed lightly to remove the plating and restore the part to its original color.

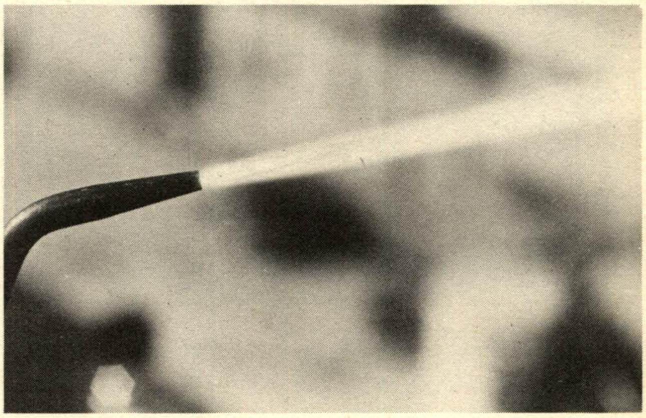
There is a strong temptation to attempt to case harden old receivers, breechblocks and locking lugs. Don't! This type of work always should be left to those shops that specialize in this type work – not only is expensive equipment required, but a vast knowledge of metallurgy. Failure to follow this advice can result in a part too brittle and destruction of the gun with serious personal injury.

Color case hardening is really not a good finish when compared with good bluing or plating, as the color is shallow and worn easily. However, if the gun being restored requires color case hardening, there are two choices. One, as explained earlier, is having a professional shop use molten cyanide. The second choice is to fake the color. This can be done on parts that have been case hardened with Kasenit and also on mild or tool steel without case hardening.

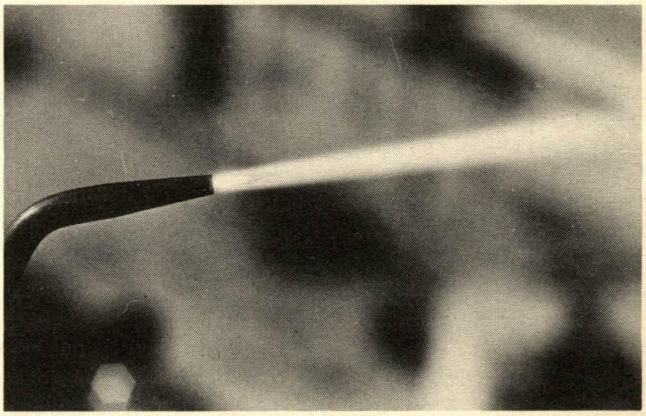
A fine tip oxy-acetylene torch is required, plus a bottle of touch-up blue and a bottle of tincture of benzoin. The latter can be obtained from any druggist and is perfectly safe, as its main use is in inhalants to clear sinus congestion. Make up a few swabs by rolling a small ball of cotton on the end of a toothpick. The trick is to play the torch on the part, varying the distance between the tip and surface of the metal and carefully watching the color change, but not exceeding a mild blue.

The swab coated with touch-up blue will provide the deep blue color and the swab coated with the tincture of benzoin will provide the yellow-bronze color. A swab coated with light gun oil also can be used to provide a dull yellow-blue color. It is a matter of practice, copying the flowing lines of regular cyanide color case hardening, raising and lowering the torch tip and using the various swabs. It could be termed a form of painting the color case hardening.

A good torch artist can turn out a work that takes a specialist to recognize as a fake. A thin coat of one part varnish to twenty parts fast-drying thinner applied afterwards will protect the fake job.

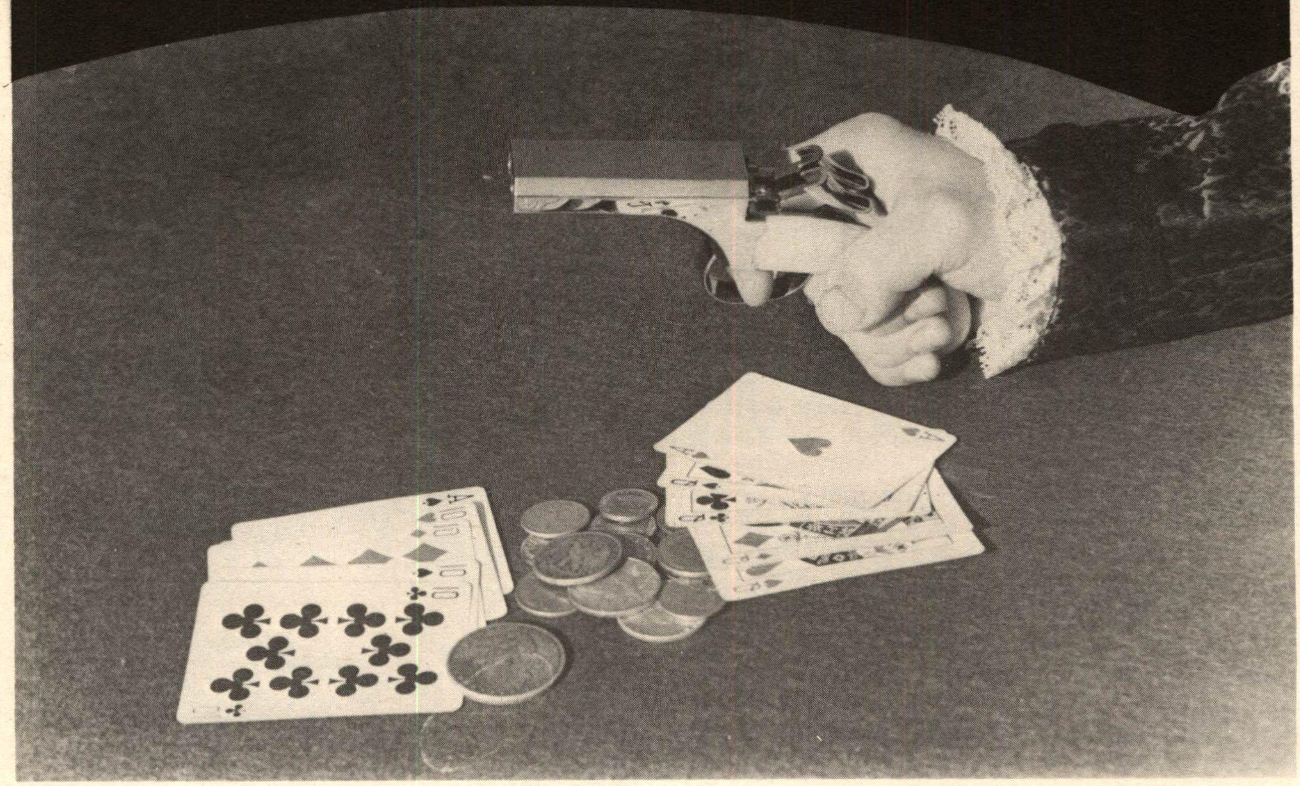


*Different mixtures of oxygen and acetylene produce different flames. Above, more acetylene than oxygen is being released, giving carburizing flame for light case hardening. Below, equal amount of two gases produces flame better suited for welding.*



CHAPTER 20

# CLASSIC ARMS' SNAKE EYES DOUBLE DERRINGER

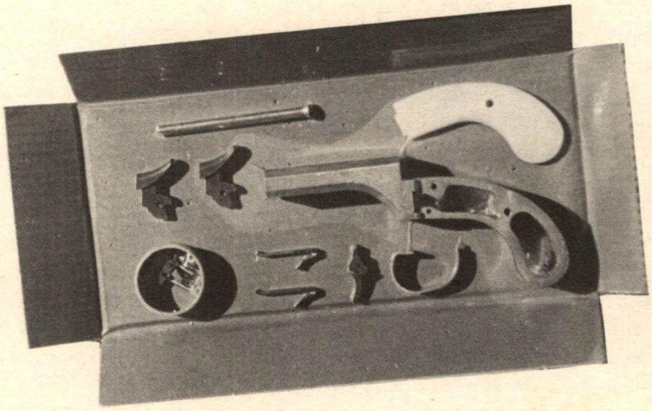


## Gun World Magazine's Jack Mitchell Contributed The How-To Of Assembling This .36 Muzzleloader

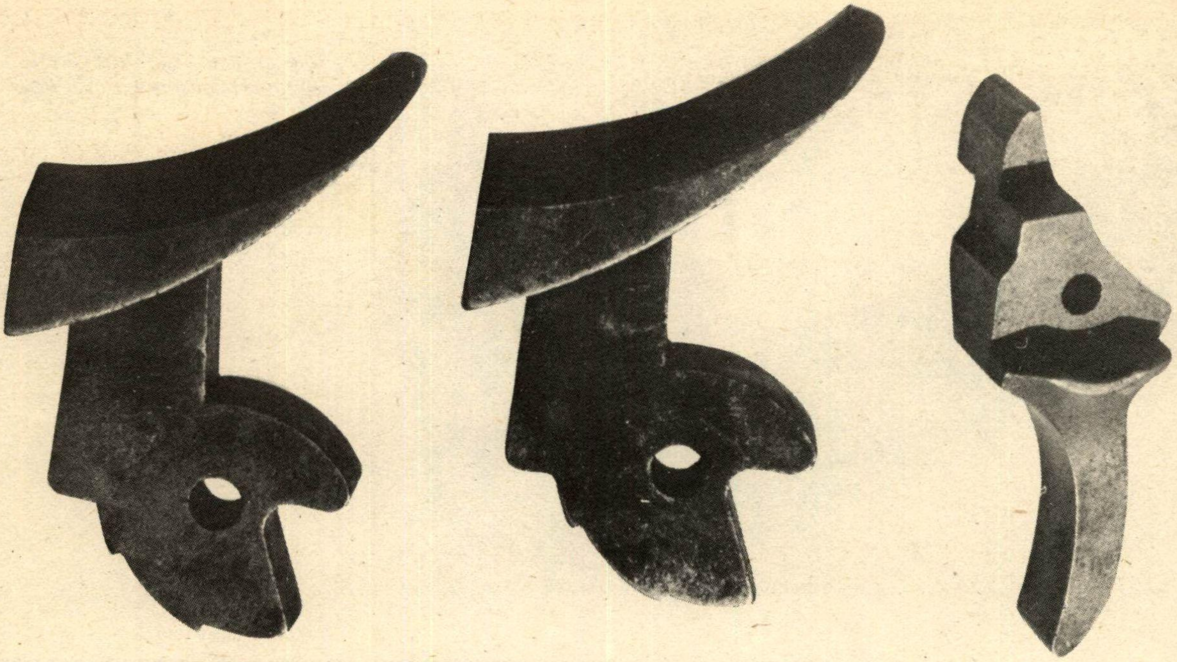
THERE ARE literally dozens of long gun and pistol black powder kits on the market today, and more are coming out each month. Starting with a simple and basic pistol model seems the best way to familiarize the beginner with the easy-to-learn skills needed to build a fine-looking addition for the gun cabinet.

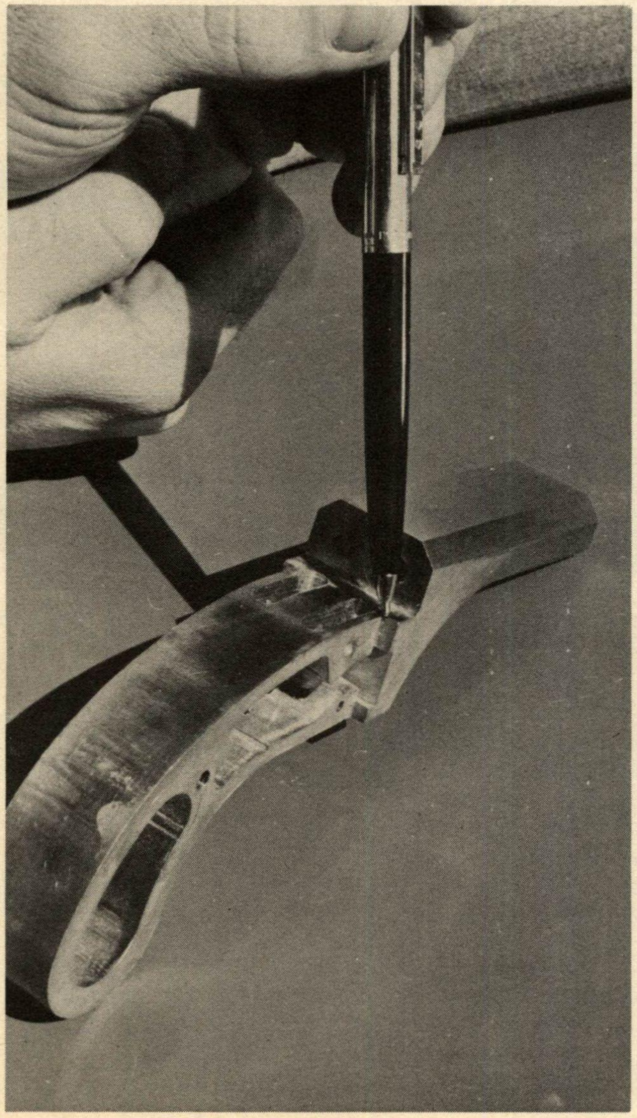
The particular kit selected to get the rookie started is the Snake Eyes .36 caliber double derringer from Classic Arms International of Lynbrook, New York 11563 for $49.95 at this writing. (New York residents should add eight percent sales tax when ordering by mail.)

This pistol is a brass frame and barrel side-by-side muzzleloader. The grips are made of pearlite, so there is no woodworking necessary. Putting this kit together involves metalwork only. With the brass frame, steel hammers and

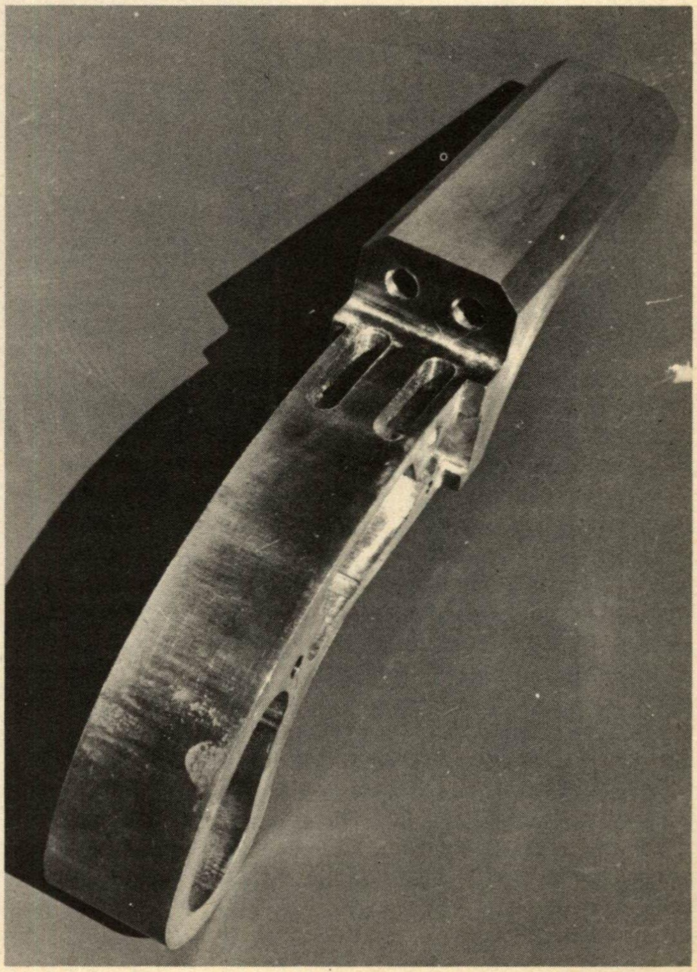


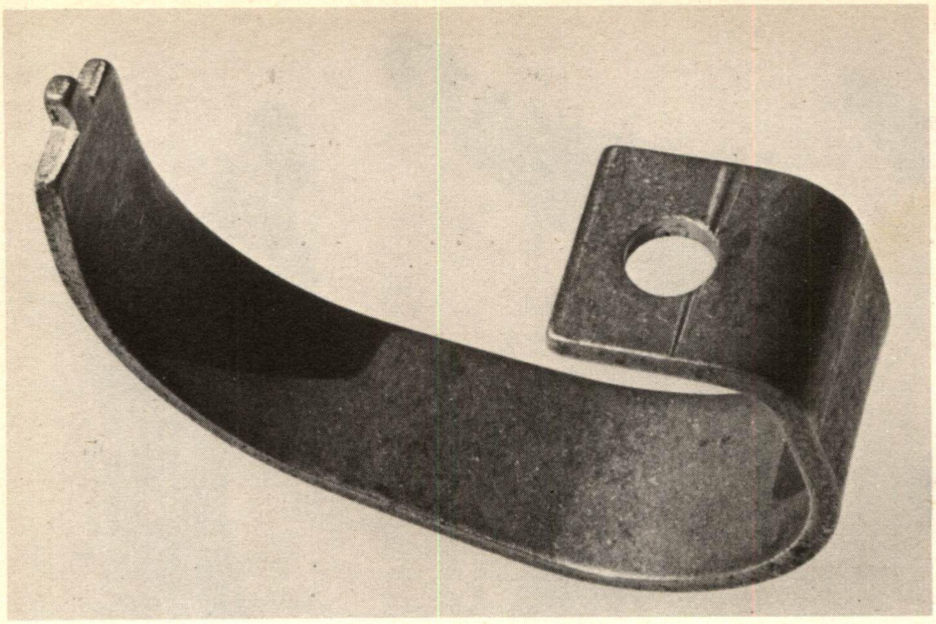
*Snake Eyes gun kit comes nicely packaged with detailed instructions.*



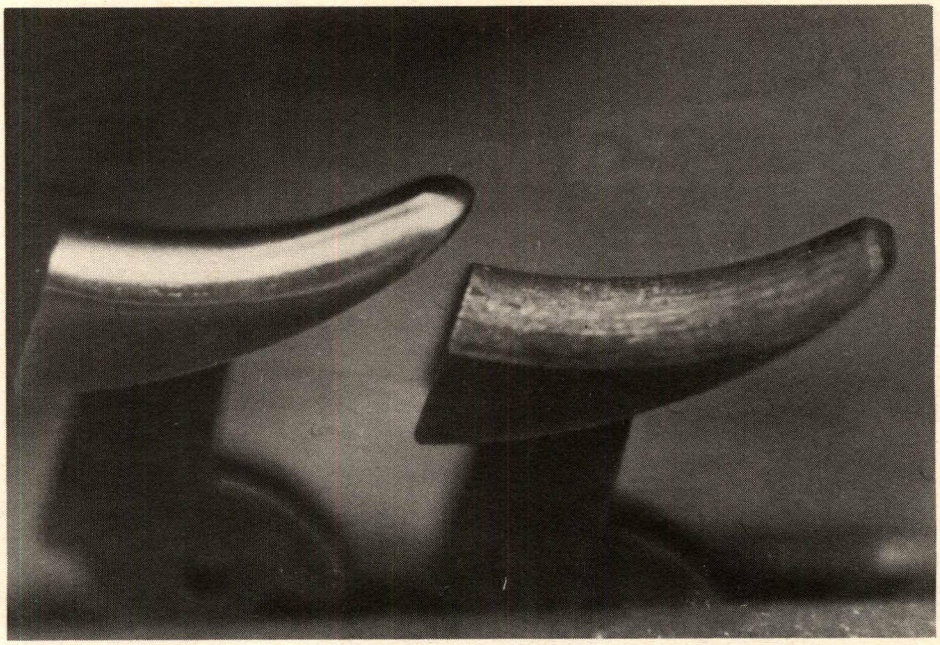


Hammers and trigger, above, need minor filing and sanding. Avoid any alteration of sear. Brass frame needs some filing, sanding and buffing before assembly. At left, pen points to slightly rounded surface that must be carefully squared off for perfect grip fit.





*Trigger guard requires careful filing to produce smooth lines.*



*Shaped, polished hammer, left, as compared with unfinished one.*

trigger guard, there is plenty to do to keep the builder busy on this first-time project. Keep the word patience solidly in your mind as it is the real key to professional results.

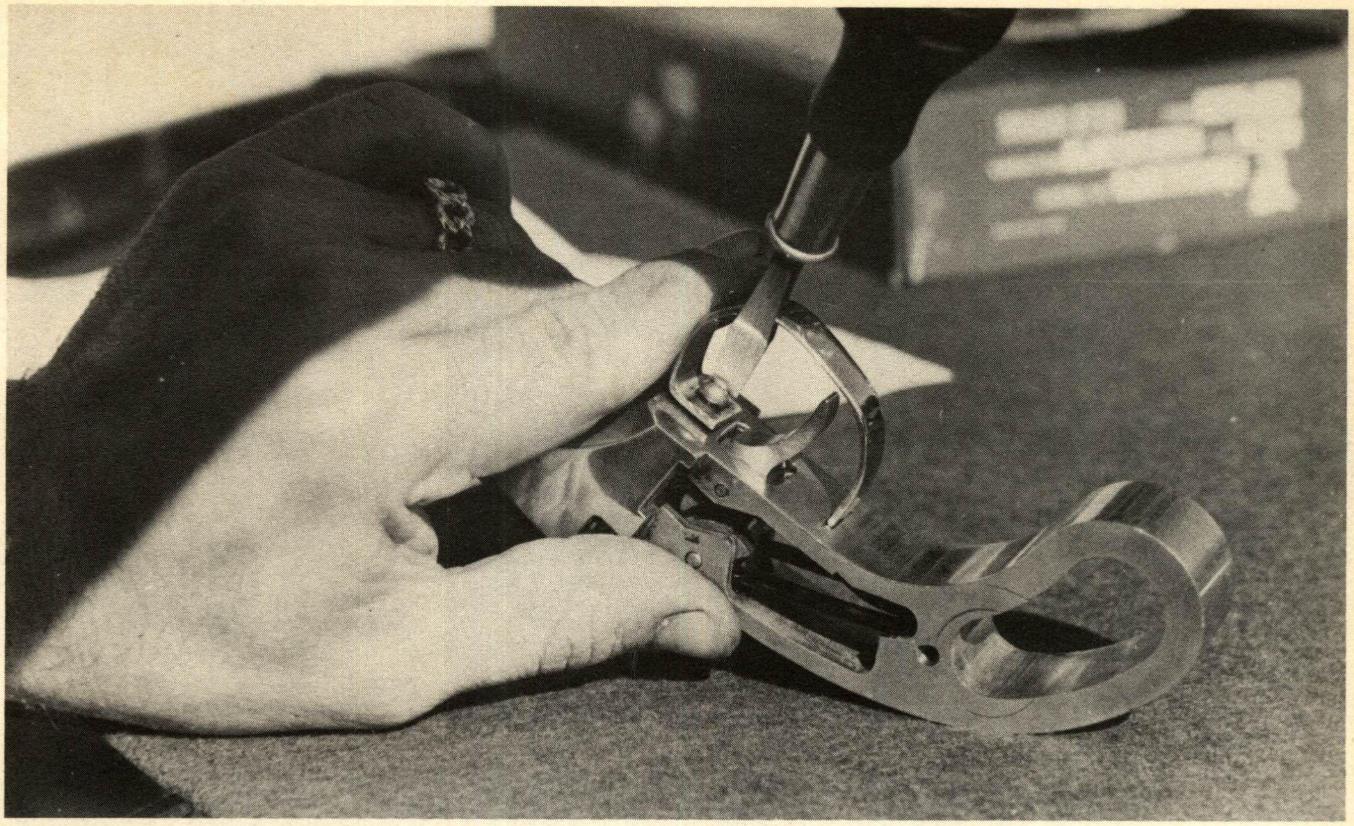
Nicely packaged, this kit comes with a minimum of moving parts, a good set of directions, and some valid firing instructions. In particular, the shooting directions should be committed to memory when you get ready to start shooting. Before starting, however, the novice is going to need certain tools to ensure that he'll end up with a professional looking firearm he'll be proud to show his friends.

Having the proper tools and the necessary instructions on how to use them is a must. Without them, the chances of success are reduced considerably. One of the most crucial aspects of building a kit gun is first understanding the instructions thoroughly and then following them to the letter. Most gun kit manufacturers realize that beginners need extra help, so they have spent the needed time and effort to make their instruction sheets as simple to follow as possible.

Safety glasses should always be worn when working around machinery and no kit builder or shooter should be without them. They also should be worn when using files and working with metal.

In order to complete this project, polishing and buffing will be applied. Polishing refers to the removal of metal, whereas buffing is the displacement of metal. In this instance, polishing will be done with sandpaper.

The type of sandpaper to use on metal is called wet and dry, and it can be purchased at any hardware store. The builder needs various grits of wet and dry sandpaper to save time and to bring the metal to the final stage before buffing. A few sheets each of 280, 320, 400 and 600 grit wet and dry paper ought to be on hand.



*Tightening down the trigger guard screw requires care and the correct-size screwdriver blade. Note smooth finish.*

What does grit mean? It means how many grits or particles there are in one square inch of the sandpaper. The fewer the number, the larger the grit; the larger the grit, the faster the removal of metal will be. More grits to the inch means slower removal and a higher polish. In order to make the wet and dry work at its optimum, something must be added to get the paper wet. Although water can be used, kerosene is better; therefore, a small amount of kerosene is needed. (Keep in mind that kerosene is highly flammable.) The wetter the paper, the better the cutting action.

A gunsmith or hobbyist can never have too many files – they are indispensable tools. Garage sales or swap meets are good places to add to the workshop supply at bargain prices. For working with the brass frame and the few metal pieces in the kit, a six-inch or eight-inch single-cut, mill file will be needed. A six-inch round or half-round double-cut file for rough shaping on the hammers and trigger guard also is handy.

Use regular blackboard chalk and rub it into the cutting teeth of each file; this kelps keep the file from loading up.

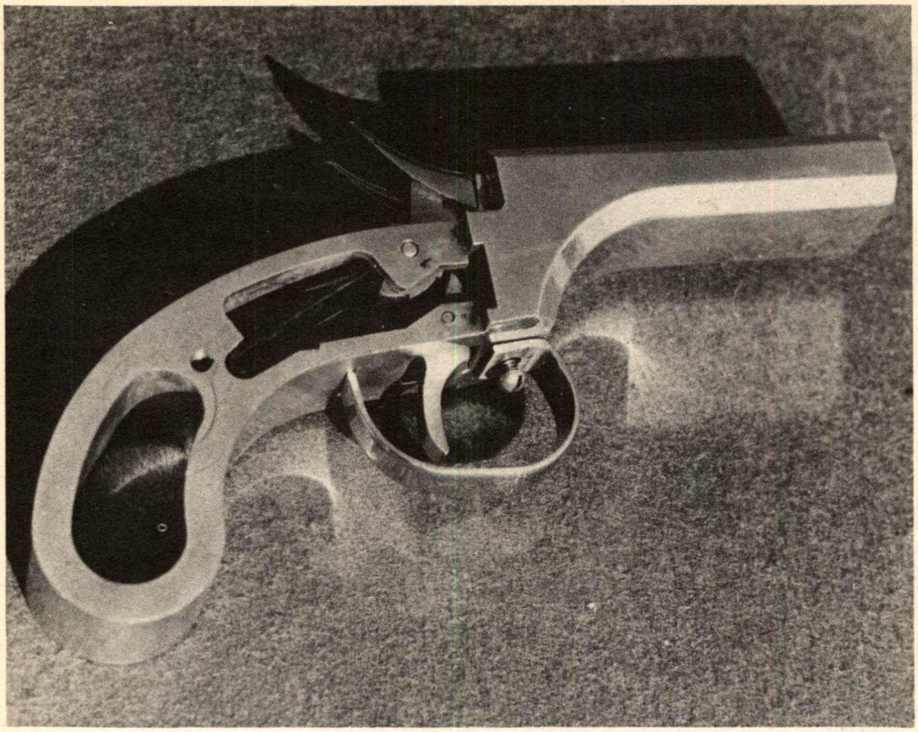
Any metal buildup on the file as it is being used may cause deep scratches in the work. Another accessory well worth its cost is a small wire brush to keep file teeth clean. Get handles for all files; files are easier to use with handles and serious injury may be prevented.

To get that mirrorlike shine on metal some sort of buffing setup is necessary. This means a buffing wheel and some sort of power tool to drive the wheel. Muslin and/or hard felt wheels work well. A small felt wheel mounted on a gadget such as a Dremel tool will give the desired results when used with a good buffing compound.

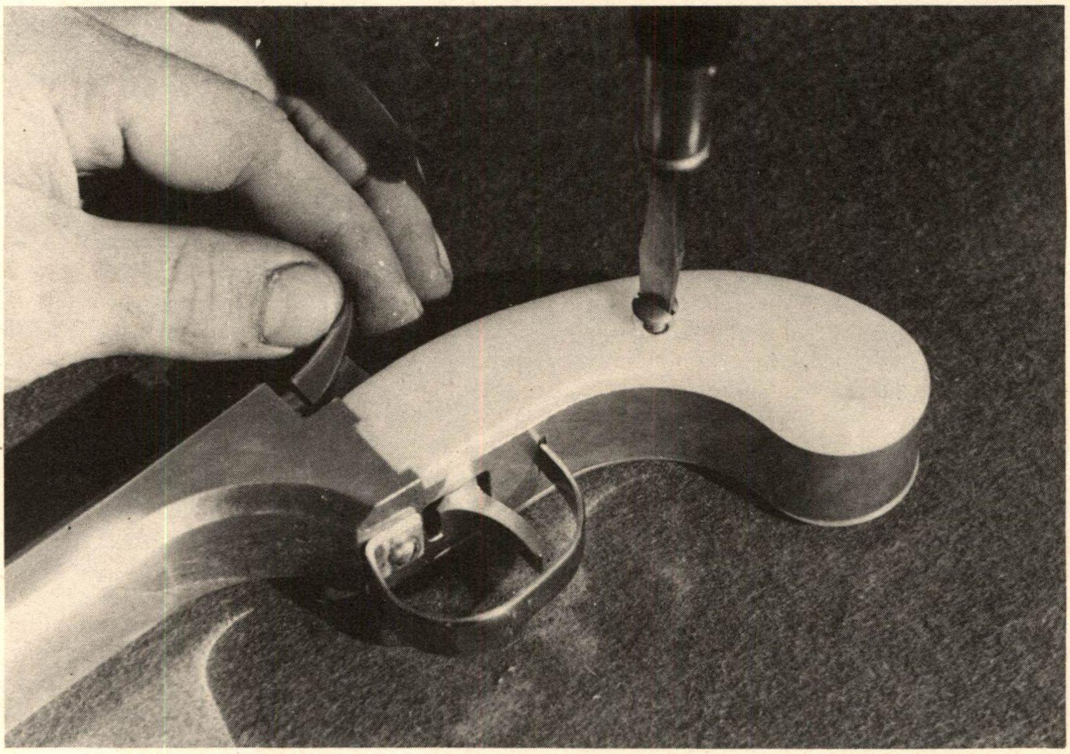
Screwdrivers that fit the particular screws in the gun kit are essential. Nothing ruins the looks of a fine-looking firearm more than bunged up screwheads. A pair of needle-nosed pliers, a small pin punch and some brass polish will be useful. More experienced gunsmiths may have a nipple wrench that fits the Snake Eyes derringer. The last piece of equipment required is a vise or a C clamp.

There are a few rough spots on the one-piece brass frame and barrels and a little file work is necessary. A vise should hold the work steady. Because the steel in the vise is harder than the brass frame, use either soft jaws, wood, or wrap the frame heavily in cloth to prevent the vise from creating dents and scratches in the brass. If a vise isn't available, place the frame on something sturdy, such as a wooden table, and sandwich a small piece of wood between the work and the C clamp.

Next step is to draw-file the imperfections out of the metal. This is accomplished by laying a single-cut mill file flat on the surface of the barrels and pulling. Hold the file at each end making certain equal pressure is maintained with each hand. Keep the file flush against the metal, so as to not round off any edges on the frame. After a complete pass, pick up the file and place it back at the starting point. Continue until all deep scratches are removed. Apply just enough pressure to let the file do the work. Keep the file clean by using chalk and the wire brush.



*Left: The Snake Eyes double derringer is complete except for installation of pearlite grips. Too much pressure on grip screw will crack grips.*



At the juncture where the front of the pearlite handles will rest, there is a slight curve in the brass frame. Square up the corners of the frame to accommodate the grips rather than attempting to reshape the grips. Lay the file into these corners and gently square them up.

After filing the brass frame begin shaping the hammers with a small round-cut file. The hammers and trigger guard are rough enough to warrant reshaping and careful filing to achieve a graceful line.

It is extremely important to not file the area in front of the hammers. This is where the cocking sears are located and any removal of metal whatsoever can result in an unsafe and/or inoperable firearm. Work only on the tops of the hammers to present a smooth and flowing line. Again, make sure that each pass with the file is in one direction only. Slide the file across the metal so as not to create ruts or furrows. The final file work will be on the trigger guard, since the one in the kit is quite rough. Break the edges with a round file to give it a more graceful line.

Sanding the metal parts requires patience, and there is

no shortcut to success. Begin with 280 grit wet and dry sandpaper. For sanding the brass frame, use a small squared block of wood as a sanding block. This will prevent damage to your fingers and help prevent rounded-off edges. Move the block from one end of the work to the other with long, smooth strokes making sure to keep the sandpaper wet with kerosene. Continue to sand each section of the frame until all file marks have been removed.

Use the same procedure again with the next higher numbered grit of wet and dry – the 320. When finished with 320, move to the next finer and the next. By the time the 600 grit paper is reached, there should be no scratches or pits showing in the metal.

Each piece requires the same formula. Results are directly proportional to the amount of time and effort the builder puts into the project. It may take eight to twelve hours to achieve the desired effect of finishing to produce a professional looking job. Patience will pay dividends.

Buffing with a Dremel tool mounting a felt wheel and some jeweler's rouge will bring the parts to a mirrorlike professional finish. This tool has a multitude of uses around the shop and is an excellent investment.

If a Dremel tool or buffing wheels are not available, a possible alternative is a loose muslin buffing wheel, which will fit a power drill. These may be purchased through a number of sources, including local hardware stores. They sell for just a few dollars and will save hours of labor.

One word of caution when using any buffing wheel: Make certain the surface is clean and free of any foreign matter. Buffing both brass and steel may leave some steel particles caught in the wheel after use. These particles will cause deep scratches in the brass frame, so make a careful inspection of the wheel before each use.

The first step in final assembly is to screw the two nipples into the frame. Lightly lubricate the nipples to make disassembly easier. The nipples are first screwed on by hand, with final tightening accomplished using a nipple wrench or a pair of needle-nosed pliers. As the kit does not come with a nipple wrench the latter may be necessary. Don't let the pliers come in contact with the brass frame or they will scratch the surface.

Place the trigger in through the square opening in the underside of the frame and insert the trigger pin. Do not push the pin all the way through the trigger. Place the sear through the frame and after aligning the two, gently tap the trigger pin through the sear and into the opposite side of the frame. Slide the trigger spring into the slot provided for it just in front of the sear and trigger. Gently depress the right-hand spring far enough to allow clearance past the sear. Depress the same right spring by reaching around from the right side of the frame and, with a small screwdriver or drift pin, push the entire trigger spring in from the left side until it is fully seated.

Place the right hammer in its slot and align the holes. Press the hammer pin through the frame and hammer from the right side. Push the left hammer into position and drive home the hammer pin locking both hammers in place.

Place the long end of the right hammer spring on top and push it into the slot behind the hammer. Compress the spring with a pair of pliers and slide it into the frame. Repeat the procedure with the left hammer spring. Both hammer springs should be seated approximately one-sixteenth inch into the frame.

Cock each hammer, testing that each hammer cocks properly. Do not dry-fire the gun as this will damage the nipples. Ease the hammers forward by pulling the trigger and holding the hammers, letting them down carefully.

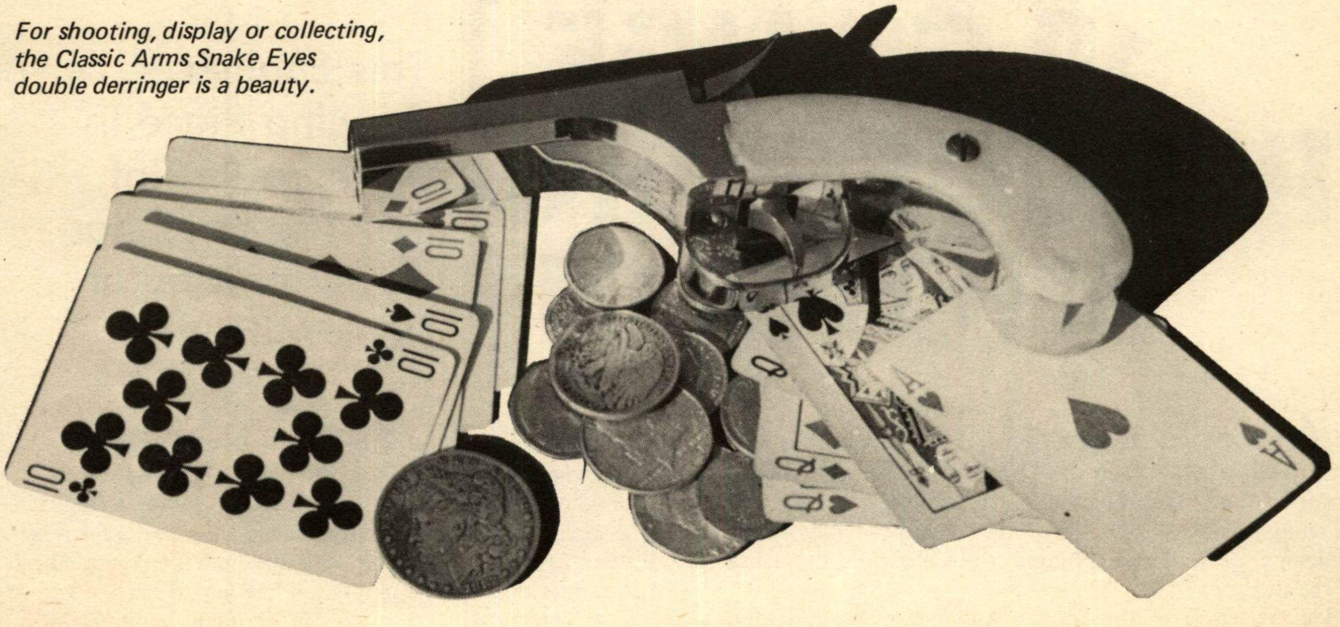
Spray the internal working parts with a lubricant such as G96 Gun Lubricant. The gun will operate more smoothly and with little rusting.

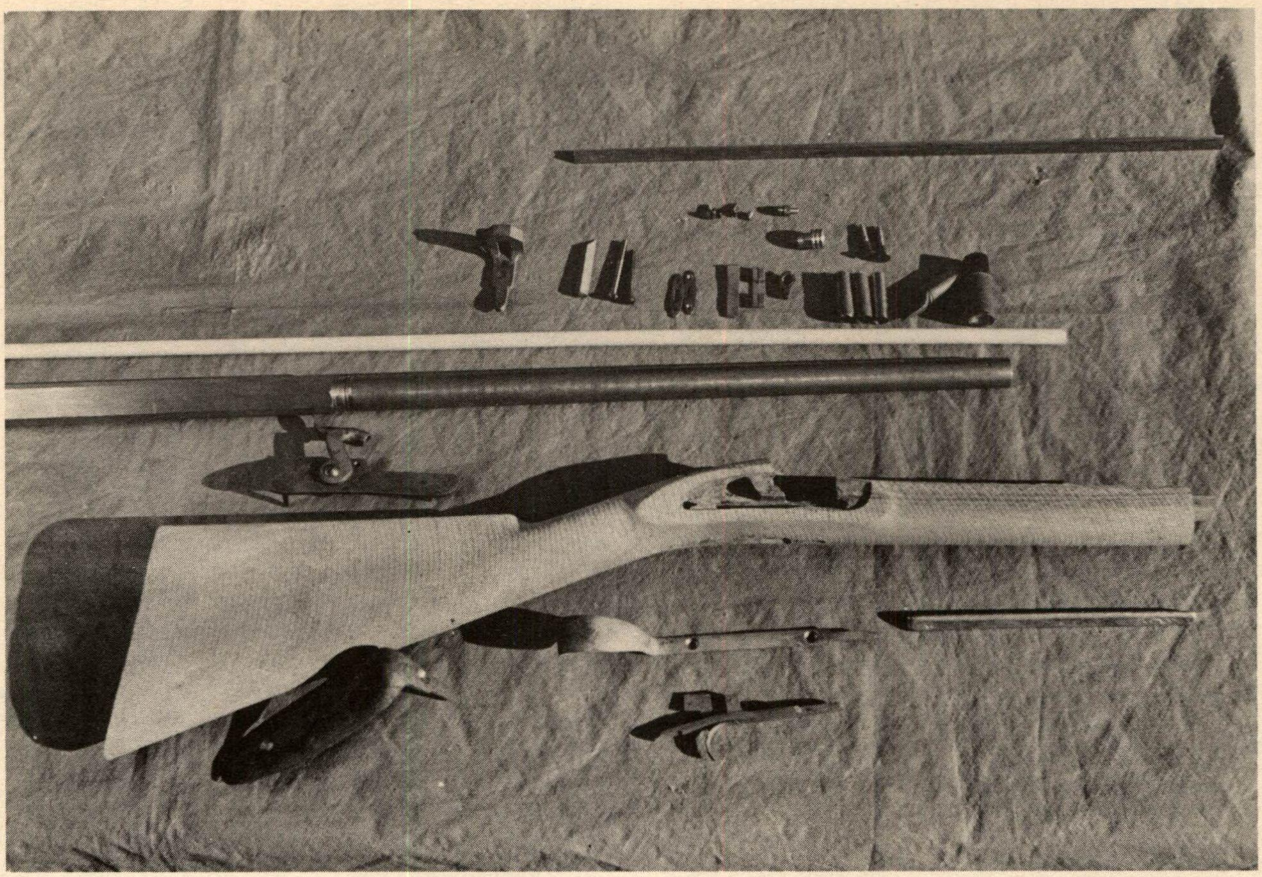
Carefully screw each of the pearlite grips in place and the Snake Eyes derringer is completed.

The final product is a direct result of the time and effort put into it. Keep the gun clean and well oiled and it should last a lifetime.

Each kit comes with complete shooting instructions, but the novice gunsmith is well advised to seek experienced counsel before attempting to fire that first .36 caliber ball from the double derringer.

*For shooting, display or collecting, the Classic Arms Snake Eyes double derringer is a beauty.*





*The Sharon percussion shotgun kit comes with California walnut one-piece stock and all necessary iron furniture.*

**CHAPTER 21**

# THE SHARON 12-GAUGE PERCUSSION SHOTGUN

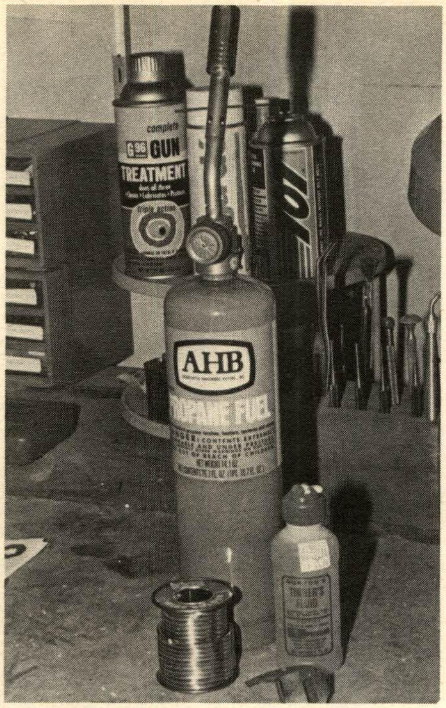
## This English Fowling Piece In Kit Form Is Not For The Beginner Says Contributor Jack Mitchell

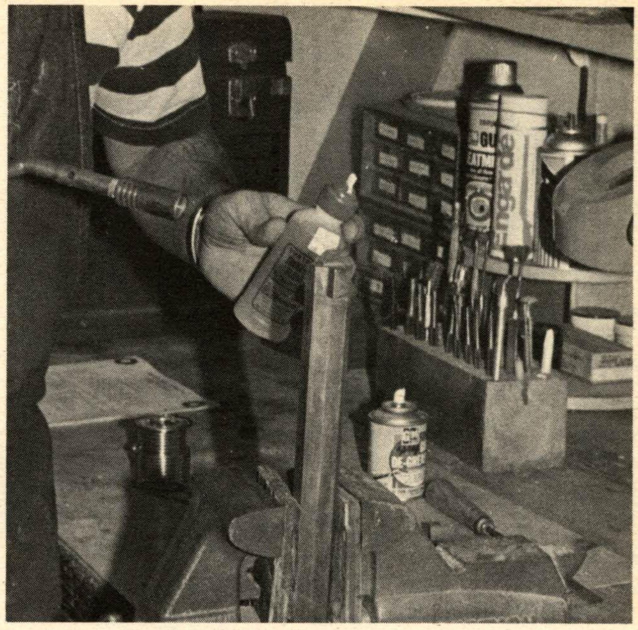
ALTHOUGH BLACK powder manufacturers are turning out a wide variety of rifles and pistols in kit and finished forms, relatively few are producing black powder shotguns. One of the few, the Sharon Rifle Barrel Company, of Kalispell, Montana, produces a top-quality shotgun.

The firearm is an authentic reproduction of a mid-1800 English muzzleloading shotgun. It is a single barrel, percussion cap type with a thirty-inch octagon-to-round smoothbore barrel. A unique feature is that the barrel can be interchanged with a Sharon octagonal rifle barrel. The shotgun is available in 10 or 12 gauge, and interchangeable rifle barrels are available in .50, .54, .58 and .62 calibers.

The octagonal section of the shotgun barrel is 10½

Solder, flux and a heat source of sufficient strength are necessary to complete project.



Careful application of heat is necessary when soldering tang to barrel. See text for details.

inches long and is breeched with a hook patented breech. The stock is of California walnut with the barrel channel close to being fully inletted. The stock is ninety-eight percent inletted for other parts; however, some hand fitting is necessary.

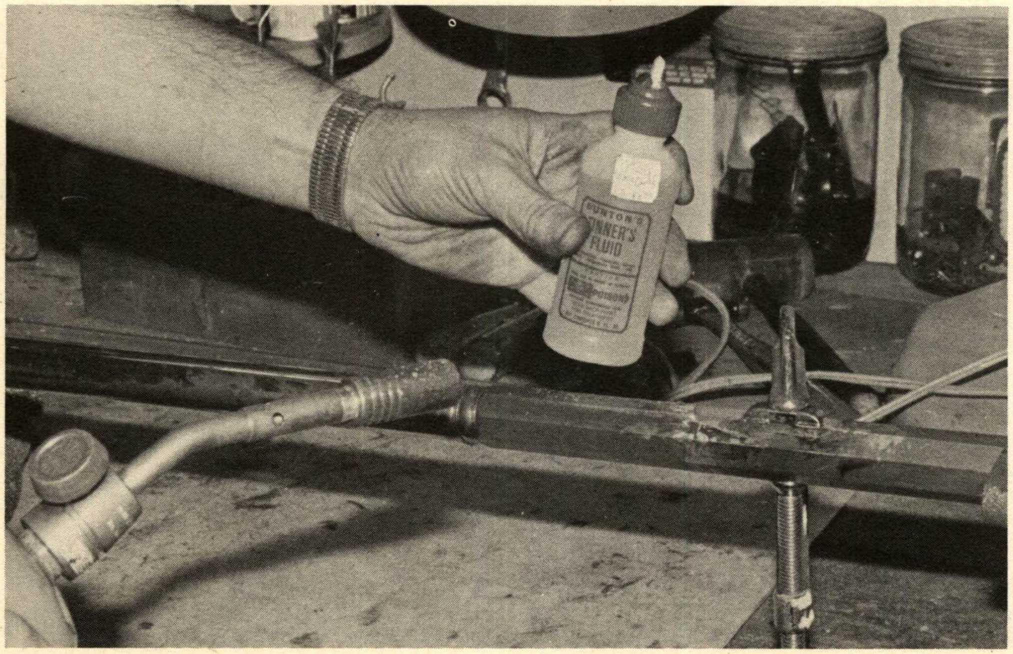
The completed shotgun weighs around 7½ pounds. All furniture is iron and the manufacturer suggests that metal parts be browned rather than blued, as were original shotguns of this period. The Sharon English fowling piece is not a kit for the beginner. It is an advanced kit for the enthusiast who has built other firearms, or has access to someone with the experience who can help when called upon. For the most part, Sharon's instructions are adequate; but pictures of a completed piece, shot from different angles, would have been beneficial.

Since this is more of a professional kit, the builder should keep in mind that patience will be of utmost importance in doing justice to the project.

Included in the kit are: barrel, hook breech and tang, stock, lock, single trigger and trigger plate, two ferrules, shotgun under-rib, wedge, two escutcheon plates, underlug, shotgun escutcheon, trigger guard, brass bead sight, entry pipe, ramrod, nipple, ramrod tip, cleaning jag, four 8x1/2 wood screws, nose cap lead, inletting black, one 8-40x3/8 screw, and four 2x1/4 wood screws.

All parts should be checked against the list to make certain nothing is missing. It saves time and aggravation to begin any kit by sorting out the smaller pieces and storing them in separate containers for use as needed.

To begin the Sharon shotgun, remove all burrs, casting




Underlug is soldered 5-3/8 inches back from barrel wedding band.

flash and casting sprue from metal pieces. Any bent pieces should be aligned. This saves time and makes inletting much easier.

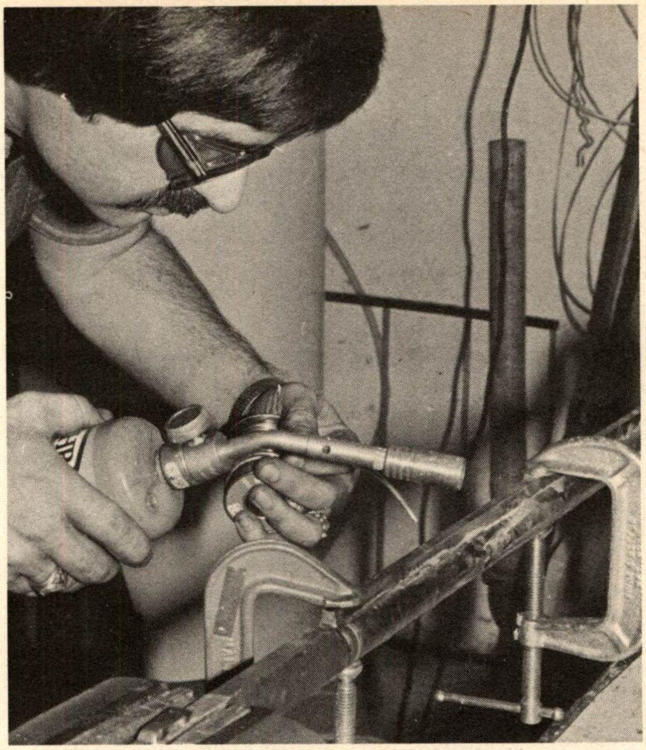
The barrel work is the first major step in completion of the shotgun. It comes finished inside, has been lapped to cylinder bore with the muzzle crowned at the factory. The breech plug also comes installed and indexed to a flat; this determines the top and bottom of the barrel.

Place the barrel in a vise with soft jaws and begin draw-filing scratches, pits and machine marks down to a smooth surface with all remaining lines running from the barrel wedding bands to the breech. Hold the file perpendicular to the barrel and proceed with long, smooth strokes, allowing just enough pressure to let the file do the work. Be careful not to break the edges of the octagon barrel. Never file across the barrel flat, as this creates waves in the metal. Carefully file the breech to match the barrel flats. Use a half-round needle file to work the notch portion of the hook breech to match the tang of the barrel. The tang will work onto the hook and come flush with the top flat of barrel.

When the hook breech and barrel tang are flush, solder the tang to the breech. Although an acid core solder is adequate, in most instances, I prefer a 50-50 tin/lead solder. With the barrel secured in a vise in the vertical position, heat and tin the hooked breech area of the barrel. Do the same with the tang. Place the tang in position and heat both parts, adding solder and flux to make a solid joint.

After allowing the work to cool, draw-file the tang and barrel to form a straight, continuous line. Although the directions say to file these parts into a graceful curve at this point, I purposely left the tang slightly high; I wanted to leave a little metal to play with until after I had the lock inletted. After this piece has been inletted, it makes it a little easier to go back to the tang area and duplicate the curve of the tang, matching one to the other.

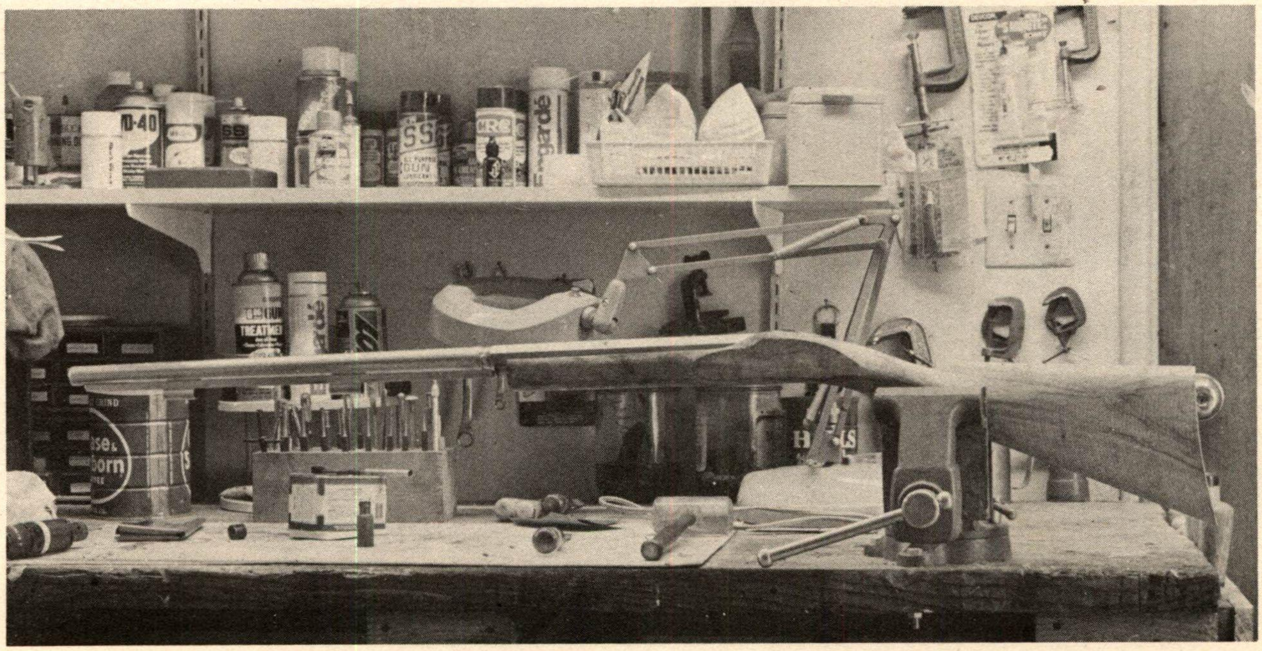
The next step is to solder the underlug to the bottom of the barrel. Sharon recommends the underlug centerline be

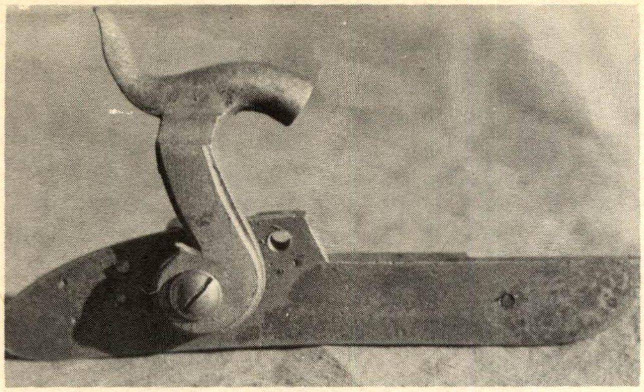


*Barrel rib is clamped flush with back of wedding band as rib and ferrules are soldered to barrel.*

5-3/8 inches back from the barrel wedding band. First, remove all flash or casting sprue from the underlug with a file. This will make sure that it seats flush to the bottom of the barrel. Tin this piece, then the spot where it will be placed. Secure it in place with a C-clamp and reheat both pieces to cause the solder to flow. Sharon recommends that an additional amount of solder be added to form a solid fit. The underlug holds the barrel to the stock during the firing of the piece, so make sure it is on solid.

*To maintain appearance of gun, barrel is carefully inletted to follow contour lines of walnut stock.*





*As received, lock plate and hammer are still rough and will require considerable, careful file work.*

The rib that must be fitted to the bottom of the barrel to assist in holding the ramrod must be soldered in place. First, make sure it is straight. It should sit flush with the barrel wedding band at one end, and run down the centerline of the bottom of the barrel to the muzzle; or it may be cut back about one-half inch from the end of the muzzle to accommodate a large loading jag on the ramrod. (Loading jags are not included with the kit.)

After figuring the centerline on the bottom of the barrel, tin both the bottom of the barrel and rib. This is a good time to tin the ferrules and ferrule locations on the rib.

Clamp the rib to the barrel at each end and both ferrules to the rib with C-clamps. Heat the barrel, rib and ferrules, adding solder as required.

Since you want no voids or gaps to show, make sure an even flow of solder fills all joints. Don't worry if the solder starts running over the barrel. It cleans up quickly and easily by using a sharp knife or just sanding it off.

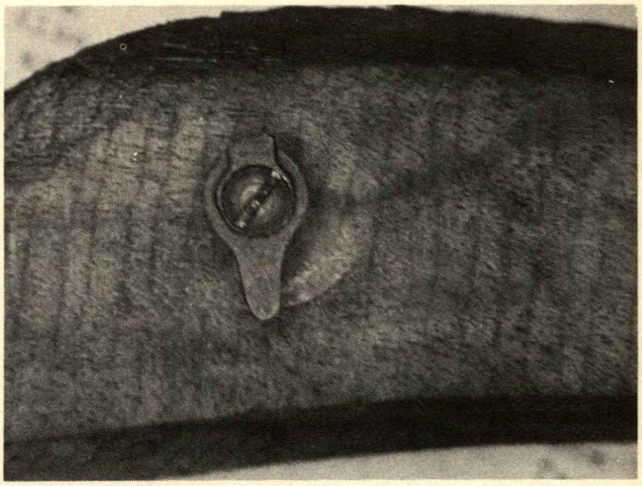
With the underlug, rib and ferrules in place, most of the polishing of these parts may now be accomplished, but don't go hog wild. You still have to install the filler (a metal piece that must be soldered to the barrel over the lock) and you must fit the barrel to the stock; you more than likely will put a few more dings and scratches into the barrel. Just clean up these parts to make fitting the barrel to the stock that much more exact.

After installation of underlug, rib and ferrules the barrel is ready for proof testing. Double the normal loads of powder to make sure you have a good, strong, dependable barrel. Pack up the barrel and find an isolated area. Sharon recommends loading the barrel with approximately five to six grams of black powder. Check first to make certain the bore is clean of oil or foreign matter, then pour in the powder. Load the overpowder wad down tight on the powder charge. Add about 2½ ounces of any size shot, making certain no air gaps exist between the load and the powder. All shot and load components must snug together.

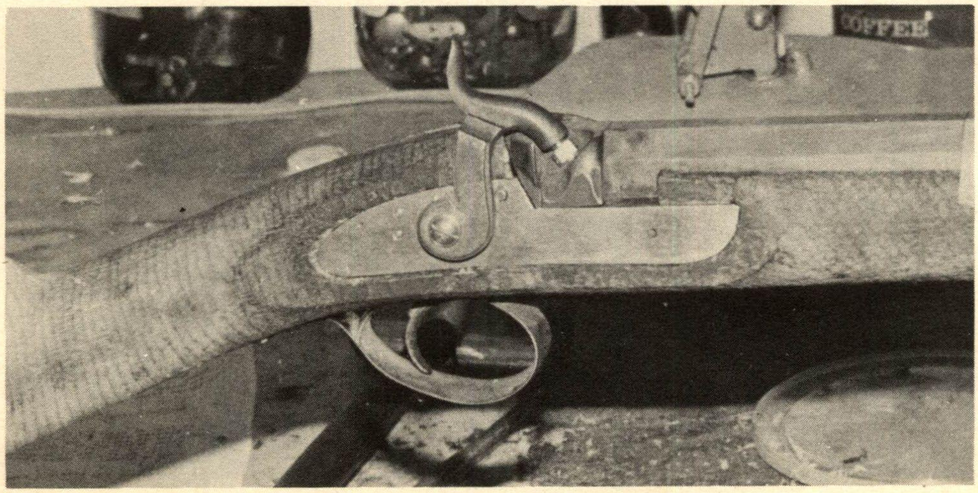
Now comes the fun part. Fasten the barrel to a heavy plank, aim it in a safe direction and, using a nitrate fuse, fire the charge. The nipple must be in the breech plug to prevent burning the nipple hole threads – the fuse is threaded through the nipple. Touch off the fuse and let her go. You naturally want to be standing behind a rock or tree during the firing. After the smoke clears, examine the barrel carefully for bulges or cracks. If it is okay, clean the barrel inside and out, oil it, and you're ready for the next step.

Inletting the barrel into the stock is where patience pays dividends and gives you professional results. The idea is to marry metal to wood precisely, leaving no unsightly gaps between the two. The piece of California walnut received was rather plain on the right side, but had a pleasing marble effect on the left. The most important factor in checking any stock is to look for weak spots. Firing heavy loads can lead to broken or cracked stocks.

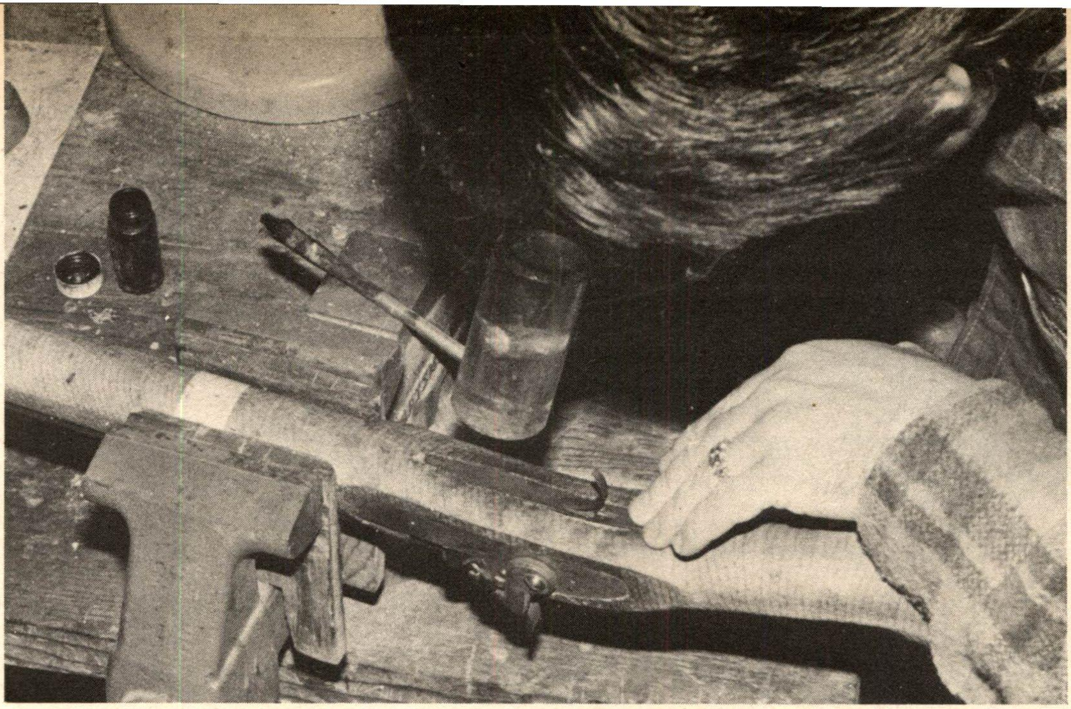
Generally speaking, the more figure in a stock, the more



*Above, lock bolt and escutcheon have been inletted in place.*




*As lock is inletted in place without internal parts, correct hammer and nipple arrangement must be maintained.*



*Keeping the correct trigger and sear engagement is essential while inletting trigger assembly.*

expensive the wood. However, the more figure, the more apt it is to crack or break if dropped against a hard surface. This is especially true of the grip area behind the receiver. A truly exceptional stock is one that has an eye-appealing figure pattern behind the grip, but is straight-grained with little or no figure in the grip region. Since this region absorbs the greatest amount of recoil, other than the locking lug areas, strength is the key.

Before beginning, hone all inletting tools razor sharp. The sharper the tool, the more precise the cuts and the easier the task. Also, do all inletting with the grain of the wood. Attempting to work against or across the grain will result in splintering, causing unsightly gaps.

Every gunsmith prefers some aspect of specific work on guns more than others. Personally, I enjoy working with wood more than metal. The only drawback during inletting is getting one's hands blackened using inletting black. It is messy and difficult to remove. Two ways to get around tedious cleanup time is to wear disposable rubber gloves or use a substitute method for the inletting black.

I have found that adding food color to regular cold cream works quite well. Although it performs as well as regular inletting black, it does not stain hands and clothes.

To inlet the barrel into the stock, the breeched barrel, with the tang soldered to it, is installed in the stock first. The barrel is tapered, therefore it must be installed straight down into the wood. Never move the barrel backward or forward. Moving it back will produce a gap on each side of the barrel channel. The idea is to seat the tang into the stock first, then the barrel, until the entire arrangement is seated flush to the wood in a level plane to the stock.

Continue to add inletting black or the cold cream substitute to the barrel and tap the barrel into the stock, using a soft-faced hammer. Remove the barrel and remove high spots from the wood until final seating is accomplished.

After the barrel has been inletted, it is time to inlet the lock. Disassemble the internal lock parts. Sand down any rough spots on the inside of the iron lockplate and polish for a smoother functioning gun.

Install the tumbler and hammer to the lockplate again. This is important, as the lock must be inletted into the stock precisely to insure proper hammer-to-nipple arrangement. The lock must nest to the barrel tang and breech plug. Continue to add inletting black to the lock, tapping the lock with a soft-faced hammer. Remove high spots until the lock is fully seated. During this operation, make sure you have a slight three to five-degree draft angle to allow the part to take up any gaps as it is seated.

*Stock is drilled through with 3/16" drill using existing tang hole, layout lines, as guide.*

After it is in final position, remove the lock and reassemble all of the internal parts. Add inletting black to the internal parts and remove sufficient wood to give the internal parts enough room to function during the cocking cycle of the lock.

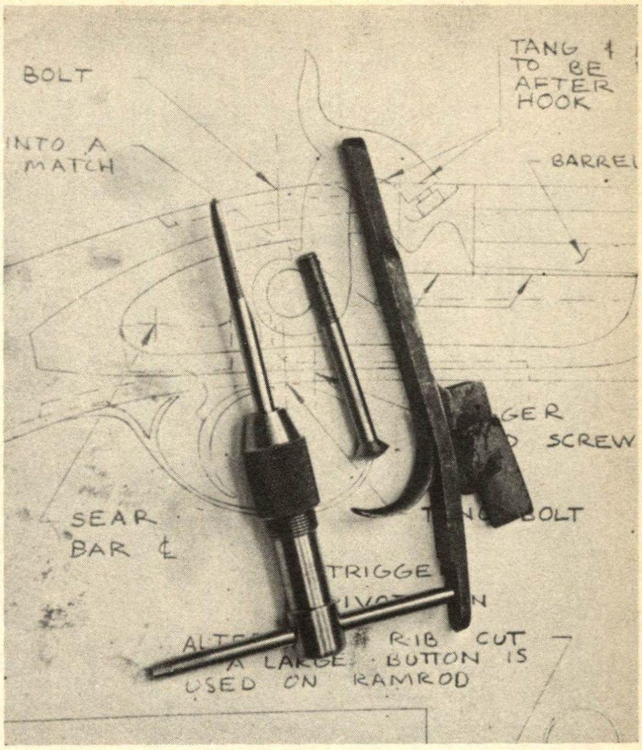
Many of these particular operations require time and patience. If you tire, take a break. Hurrying any particular aspect can mean sloppy results and may lead to accidents.

After lock inletting is completed, drill through the lock bolt attach hole using a No. 21 drill, which is .1590-inch in diameter. Remove the lock and redrill the hole in the wood using a three-sixteenths-inch bit. It is extremely important that the hole be drilled as close to perpendicular to the lock as possible.

Should you make an error, there is a gunsmithing trick that may help. If you have access to a buffing wheel, it is possible to polish away metal at the end of the screw threads, reducing enough diameter to make the screw fit and still lock the lockplate into the wood with no one the wiser.

Place the lock bolt escutcheon on the lock bolt and install the lock bolt by screwing it into the lock. Tighten the lock bolt enough to hold the escutcheon firmly in place against the stock with the tail of the escutcheon pointing downward. Carefully scribe around the escutcheon with a sharp-pointed knife. Remove the bolt and escutcheon and inlet the escutcheon into place. Continue to use the bolt as a guide for inletting until the escutcheon is fully seated.

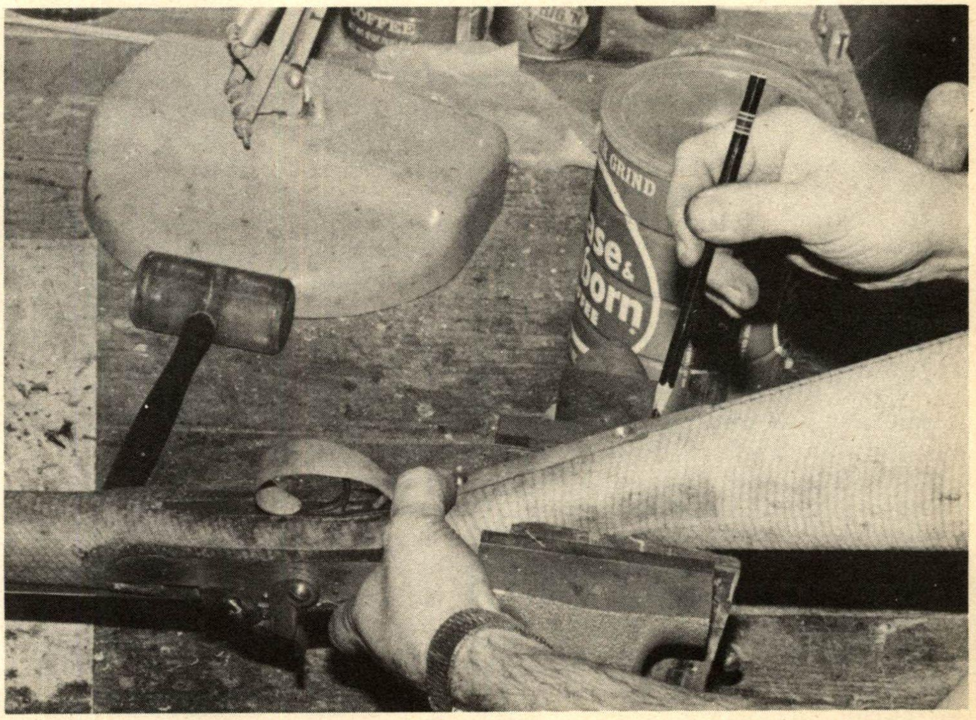
The next bit of inletting involves the trigger and trigger plate. This can be a bit tricky. Not only must the trigger plate be set into the bottom of the stock in a straight line, but the trigger must come into contact with the trigger sear bar which runs perpendicular to the lock. Should the sear bar and top of the trigger bear against each other too closely, the hammer will not remain in a cocked position. Should this happen, simply file down the area that comes in contact with the sear bar enough to allow the hammer to remain in its cocked position.




*Trigger plate is drilled using No. 21 drill, 10-32 tap. The inexperienced hobbyist should practice on scrap metal.*

With the trigger installed, lay out the tang bolt just forward of the trigger pivot boss. Use the existing tang hole as a guide to drill through the stock to the trigger plate. It is important that you first lay out a pencil line from the tang to the trigger plate hole centerline. This will help control the angle of drilling. Drill through the trigger plate using the No. 21 drill and connect it with the hole drilled from the

*A centerline is drawn from butt plate to trigger guard so that correct position of trigger guard may be determined.*



*Inletting black may be seen outlining trigger guard as metal is tapped with plastic hammer for trial inletting fit.*

tang. Remove the trigger plate and redrill the tang and stock, using a three-sixteenths-inch drill. Tap the trigger plate with a 10-32 tap. Screw the tang bolt into the trigger plate.

If the hole has been drilled improperly, all is not lost. The important thing is that a good, tight fit is necessary to prevent the barrel from moving in the stock when the gun is fired. Use either paste wax or a release agent to coat the tang, bolt and trigger plate, then fill the drilled hole with Brownells' Acraglas.

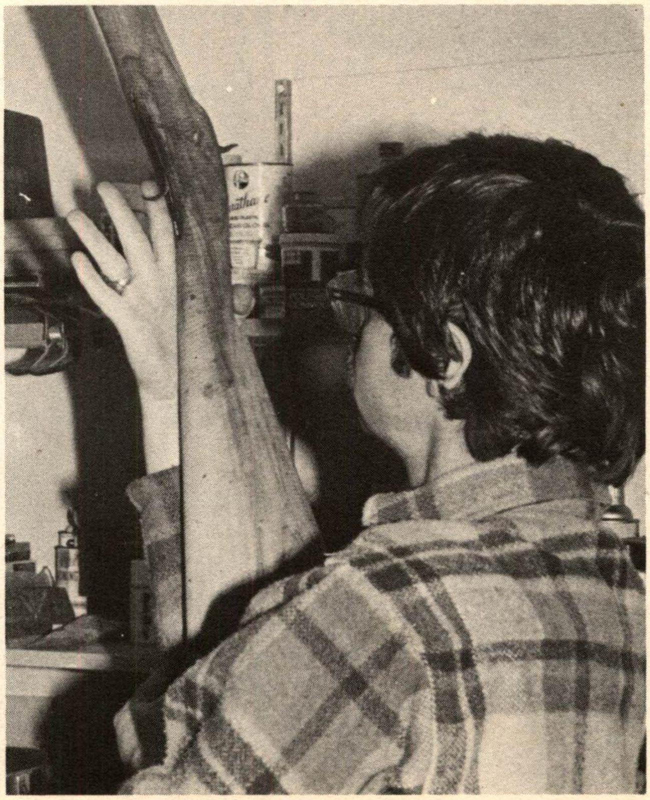
Tighten down the tang bolt to the trigger plate and set it aside until the Acraglas hardens. This will greatly strengthen this region.

With the trigger plate securely positioned in place by the tang bolt, you're ready to inlet the trigger guard. Position this piece to the trigger plate so that the trigger guard attach hole is approximately one-quarter-inch forward of the trigger plate and tang bolt. Drill, using a No. 21 drill, then install the trigger guard using an 8x40 three-eighths-inch screw. Align the trigger guard tang straight on the stock and inlet. Making certain to return it to the trigger plate location each time, tap the tang with a soft-faced hammer. When the trigger guard tang is fully seated in the stock, install the two 8x12-inch wood screws provided in the kit.

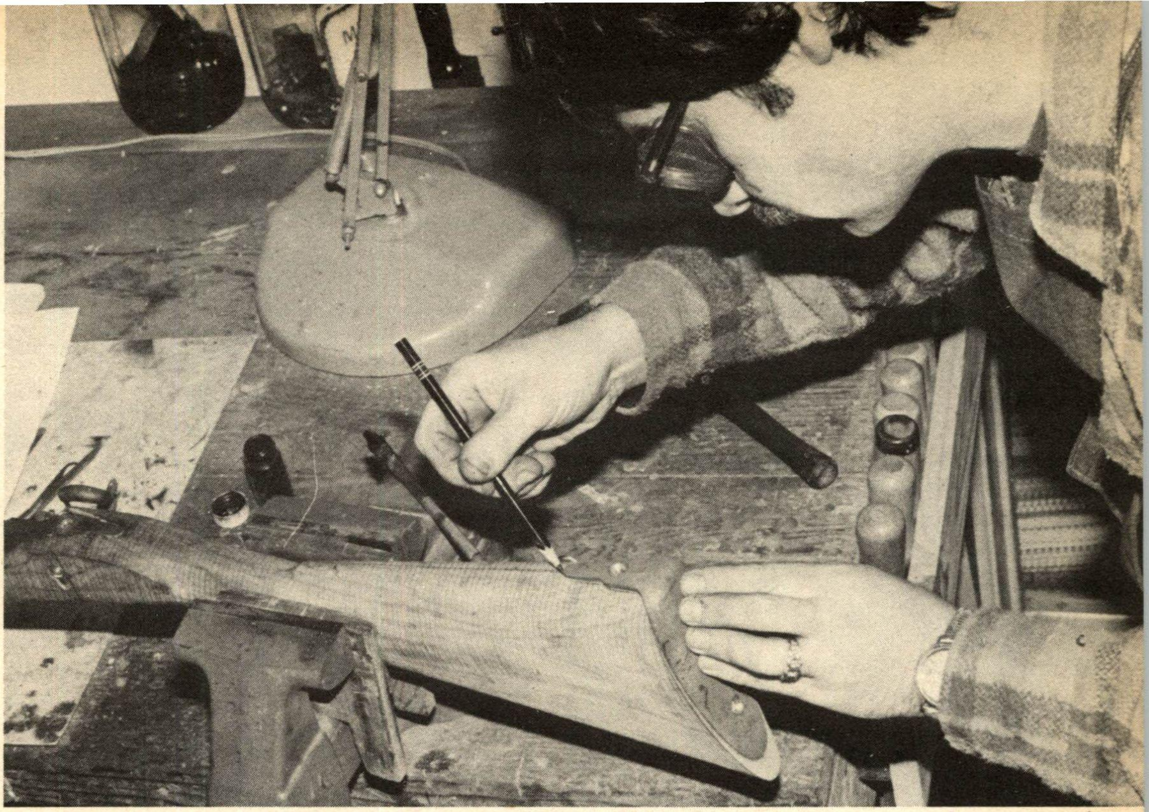
Inletting of the butt plate may be the single most important bit of work involved. Begin by checking the stock for individual fit. If the stock is too long for you, it will be necessary to remove enough wood from the back of the stock until it does fit. If the comb area back to the heel of the stock is too high, you will need to shape this area to your individual specifications. Fit the stock to your individual requirements before adding the butt plate; however, do not remove any wood from the bottom of the stock. This will be accomplished after the butt plate has been installed.

The butt plate heel extension is not factory inletted. The butt plate should be laid out first with a pencil. Remove wood from the back of the stock in the same shape as the butt plate. Begin by removing wood from the top of the

*Length of pull on shotguns is generally measured as the distance from inside elbow joint to halfway point of trigger finger tip and first joint. Pull length must be determined before butt plate installation.*



Centerline is established and butt plate position is carefully outlined.



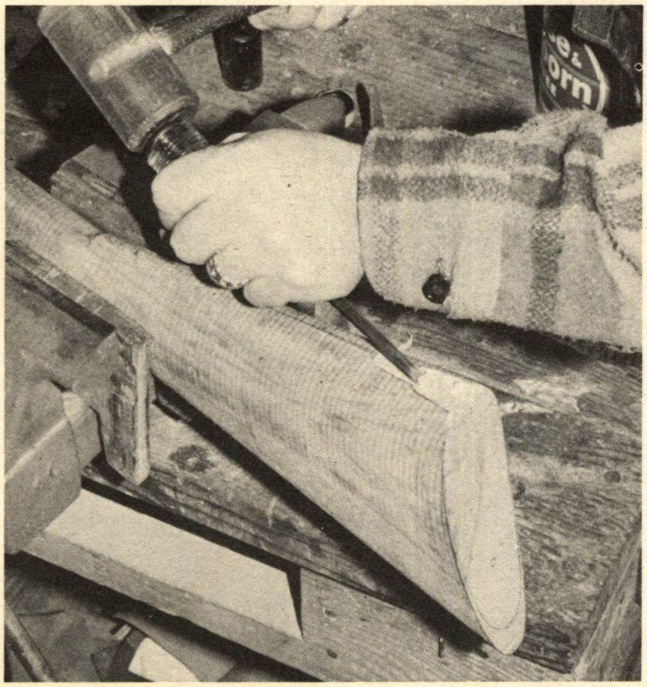
stock within the pencil line traced around the top of the butt plate extension. Although you are attempting to inlet the butt plate extension from the top down into the stock, the butt plate will come in contact with the back of the stock. It will be necessary to remove wood from this area as well.

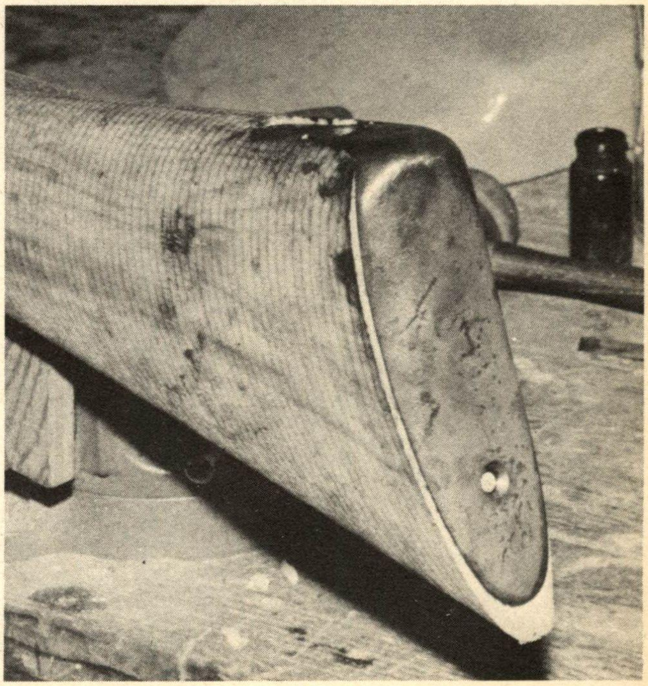
What we're trying to do is to get the butt plate extension to seat horizontally with the established comb line, yet get the butt plate itself to seat perpendicular to this line. Without going into a great deal of technical data on pitch, cast-off, cast-on, etc., remember that the fit of any gun determines more than any other factor how well you will be able to shoot and hit the target. Fitting of a butt plate incorrectly also can result in a bruised shoulder.

After fitting the butt plate flush with the top and back of the stock to your individual dimensions, you will notice that excess wood is still remaining on the bottom of the stock, running from the trigger guard in a straight line with the bottom of the butt plate (or the toe). Do not remove this wood yet.

A metal piece called the filler, which nests to the top of the lock plate and back flush against the front of the breech

*As butt plate is inletted, wood should be removed a little at a time, using sharp chisel cutting only with the wood grain. At lower right, butt plate has been fully inletted leaving considerable wood at stock toe.*

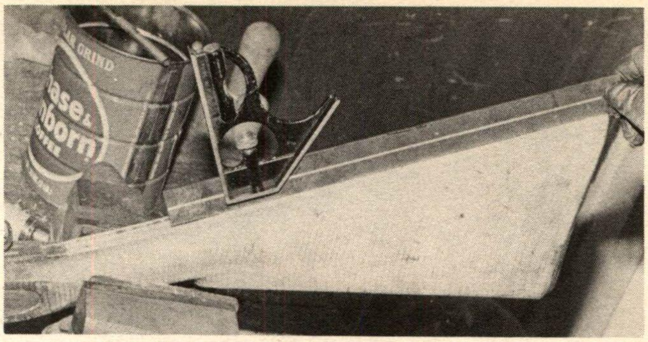




plug, now should be soldered to the barrel. Remove the burrs and casting sprue. Remove wood above the lock until the filler sits in place. Using Dykem Steel Blue on the barrel, scribe a line flush with the top of the filler, then remove the barrel from the stock. Tin both the barrel and filler. Solder the filler to the side of the barrel and file to form a smooth line that matches the outward extension of the breech plug. To avoid gaps, take your time for a perfect fit.

It is now time to inlet the entry pipe into the stock. This piece must be fitted flush to the nose cap line on the stock and aligned to accommodate the ramrod in the stock. After proper seating, drill through the stock and top of the entry pipe tab using a one-sixteenth-inch bit. Gently tap a finish nail pin through the hole and file it flush on both sides of the stock. Repeat this operation adding the second pin to prevent the entry pipe from wobbling.

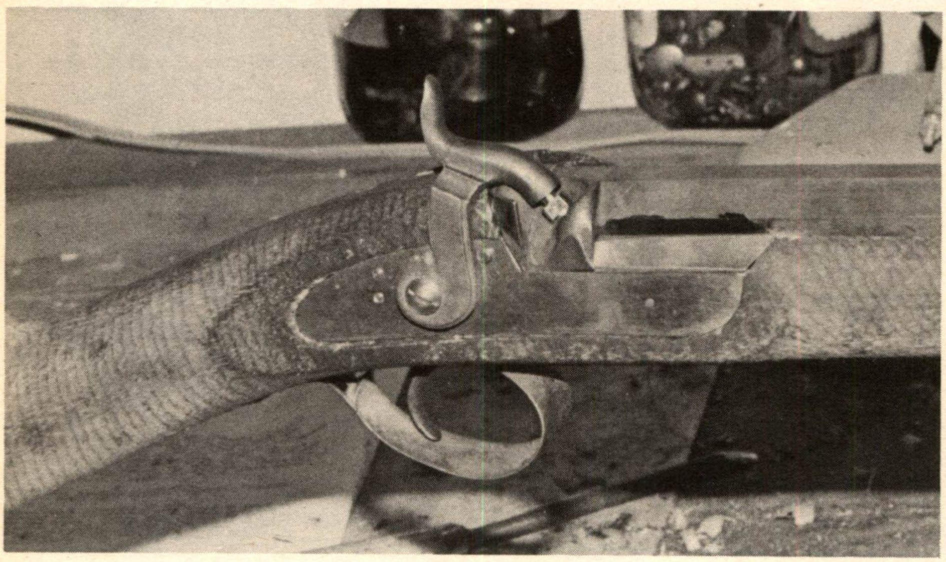
Sharon provides a piece of lead with this kit which must be melted and shaped to provide the nose cap. Before melting the lead, lightly countersink a few holes inside the barrel channel to hold the melted lead in place. The barrel must be in the stock. Fill the entry pipe completely with a



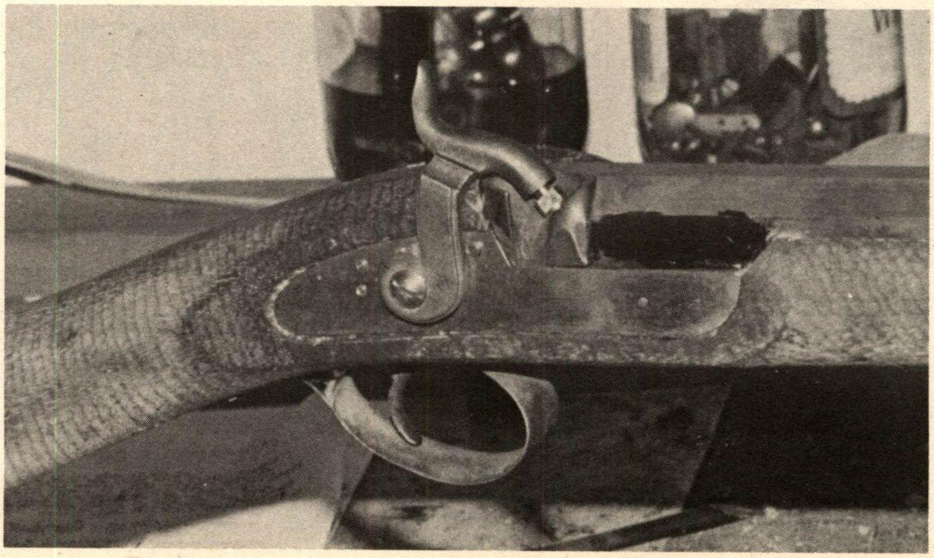
*Stock surface from line of trigger guard to bottom of butt plate should be straight line, as shown.*

piece of scrap dowel to keep the lead from entering this area.

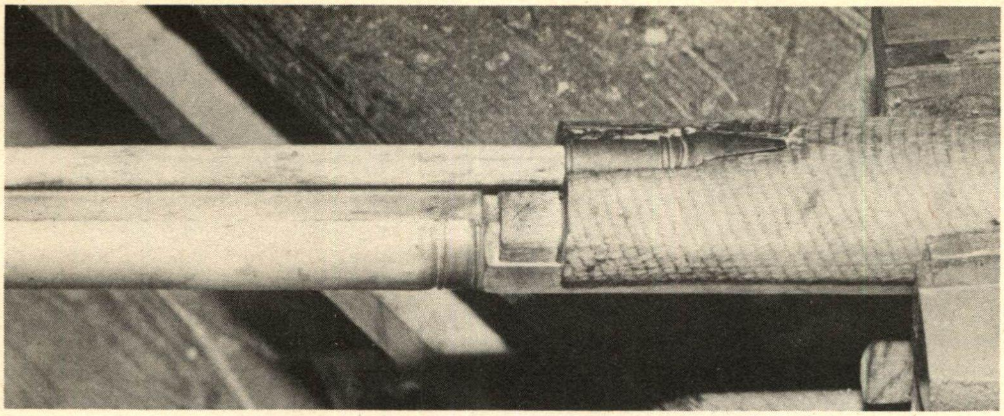
Dams can be made by placing masking tape on either side of the barrel channel. Dams must be formed to make a smooth contour from the side of the barrel onto the wood, from the wood up onto the entry pipe, from the entry pipe



*Wood is removed from side of stock above lock and filler.*



*Dark spot is Dykem Steel Blue, used to scribe line around filler. Barrel then is removed from stock and filler soldered in place on barrel.*



*Entry pipe is inletted in stock until ramrod hole in both stock and pipe are correctly aligned.*

back to the wood and from the wood to the barrel side. Hand form a piece of light cardboard or even an old playing card to lay over the dams and extend up the barrel so that the wood on the end of the stock is overlapped by about one-quarter inch. This form should cover the end of the barrel rib by one-eighth inch. Rubber bands or masking tape will hold it in place.

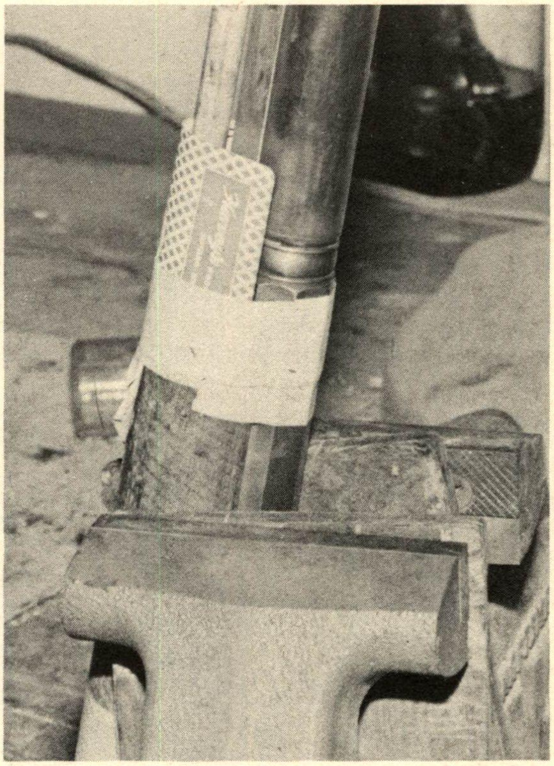
I used a Lee 120-volt, 400-watt Precision Melter to melt the nose cap material. It is important not to overheat the lead, as air bubbles will result.

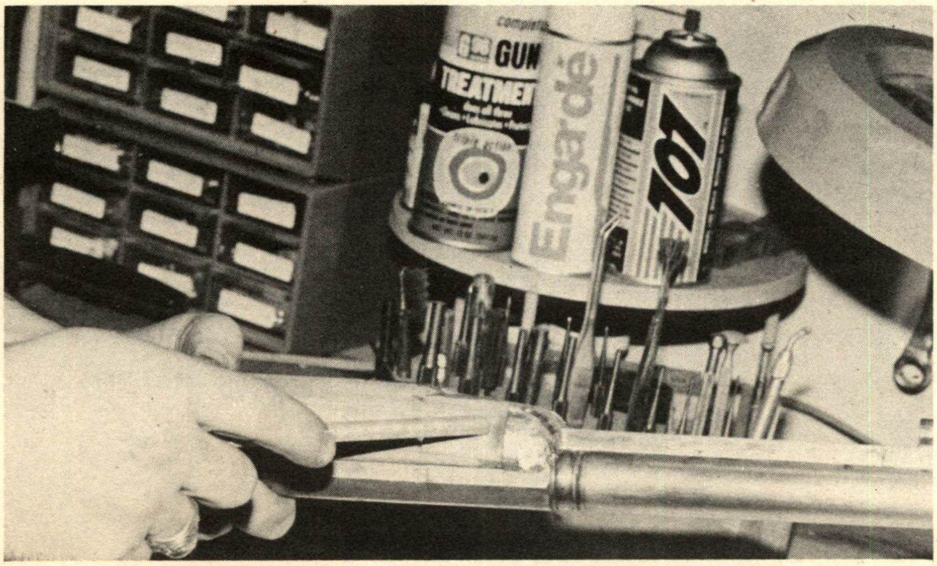
Holding the shotgun vertically, carefully pour the molten lead into the form. Allow it to cool, then remove the dams and entry pipe plug. Contour the lead, filing it flush to the stock and sand smooth.

If you should have holes – air pockets – in the lead after removing the dams, there are ways to fill them. You either can heat another small portion of lead and fill the holes, or it is possible to heat the nose cap with a soldering iron until the lead fills the gaps.

Remove the barrel from the stock and wipe on Dykem Steel Blue to the area next to and above the underlug area. We now are ready to add the wedge and escutcheons.

Begin by scribing two vertical lines from each inner side of the underlug directly up to the top of the barrel. Install the barrel into the stock and extend these lines back down onto the wood. Do this on both sides of the stock. Drill






*Constructing lead nose cap required use of several soldering dams between stock, entry pipe and barrel. Above, playing card proved stiff enough to hold proper angle. Nose cap material must be heated until just molten.*

three one-eighth-inch holes to make a three-eighths-inch wide slot. Drill from both sides into the underlug. Remove excess wood from between the holes with a small chisel. Because the wedge holds the barrel down in the stock by its fit between the top of the wedge common to the wood and the bottom of underlug, the slot should be slightly low instead of high to ensure a tight fit and hold the barrel in place during recoil.

With the wedge hole clearly established, place one escutcheon on the wedge and tap the wedge into place through the underlug. Outline the position of the escutcheon on the stock, inlet flush with the stock, drill holes for the screws using a one-sixteenth-inch bit and install the screws to anchor the escutcheon. With the wedge protruding through the other side of the stock, fit the other escutcheon in place and secure. File the wedge flush with the escutcheon for a perfect fit.

With all hardware installed on the gun, final shaping of the stock may be accomplished. Remove enough wood to flush all metal parts to the wood, but keep in mind that the traditional lines of the original gun should be followed. Since Sharon does not provide pictures of completed factory guns, you may have to do a little researching for guidelines.

One of the last steps in completing the gun before stock finish is added and metal parts are blued or browned is completion of the ramrod. Sharon provides an oversize wooden rod that must be tapered to match the ferrules and the ramrod hole in the stock. Tapering should provide a tight fit to keep the ramrod in place, and also will allow easy removal for reloading. Install the ramrod tip with epoxy or Acraglas. Drill a one-sixteenth-inch hole through the ramrod's brass tip and add a finish nail through the hole. File the nail flush to prevent barrel bore damage.

Bluing or browning of metal parts is up to the individual. Bell Sweeden, a Tucson, Arizona, gunsmith specializing in black powder firearms, informed me that although most fowling pieces made by American gunsmiths of the early to mid-1800s generally were browned, many shotguns imported from England were blued.

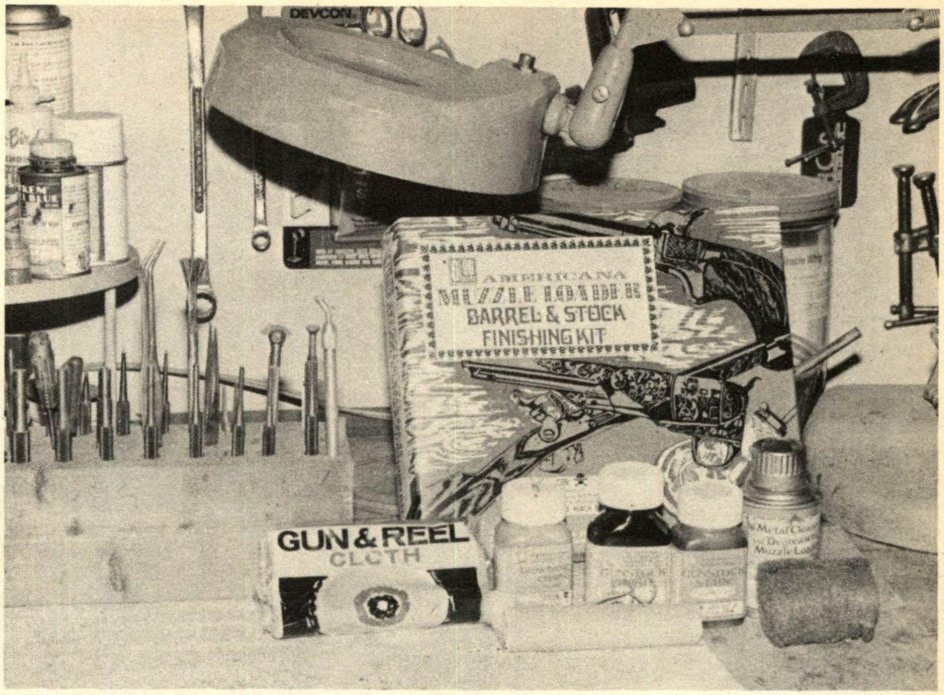
Hot-process browning or bluing is more permanent, but there also are many good cold-process browning and bluing agents on the market.

Since I like to experiment, I chose browning with the G96 Americana Muzzleloaders Finishing Kit. All metal parts first were degreased with G96 metal degreaser. Using cotton gloves to prevent fingerprints on the metal parts, I next applied G96 Antique Gun Browning Creme.

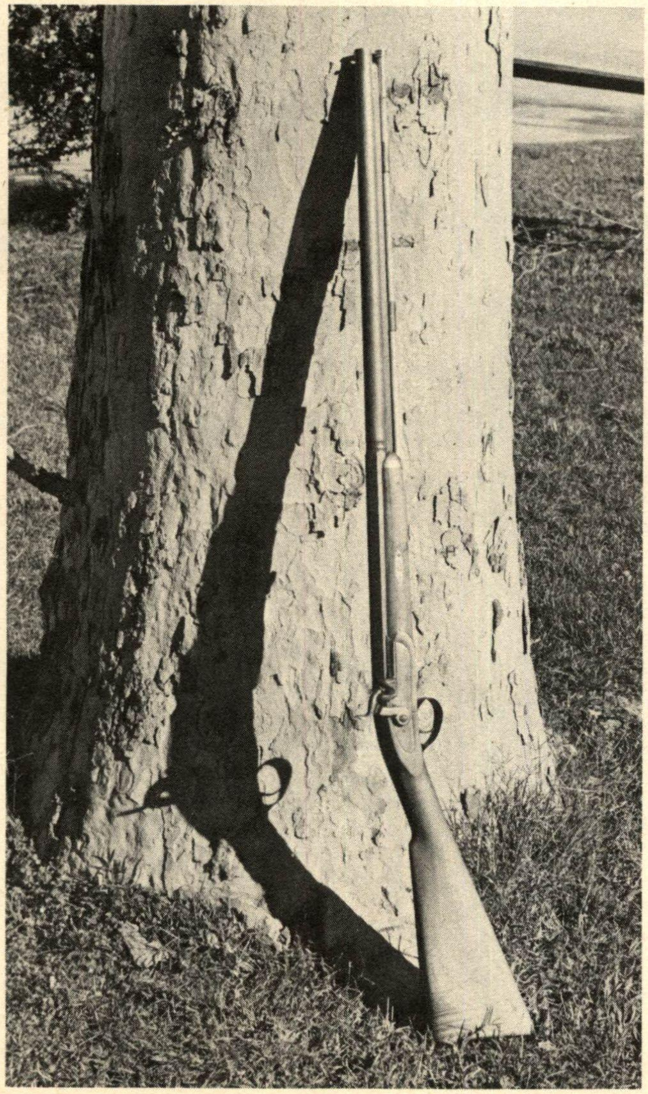
After the Creme has had a few minutes to do its work, immerse the part in water to neutralize the Creme. To get the deep brown effect I was looking for, I repeated the process three times. After soaking the parts in oil, I was satisfied with the results. The G96 cold process browning is an inexpensive, simple method to achieve professional looking results.

I decided, after my conversation with Sweeden, to use

*Watco Danish oil was used on sanded stock to bring out nice marble cake grain of stock.*




Americana Muzzleloader Barrel & Stock Finishing kit from G96 proved satisfactory to finish wood and metal of Sharon 12-gauge English Fowling Piece shotgun. Forty to sixty hours were needed to complete kit, finished below.



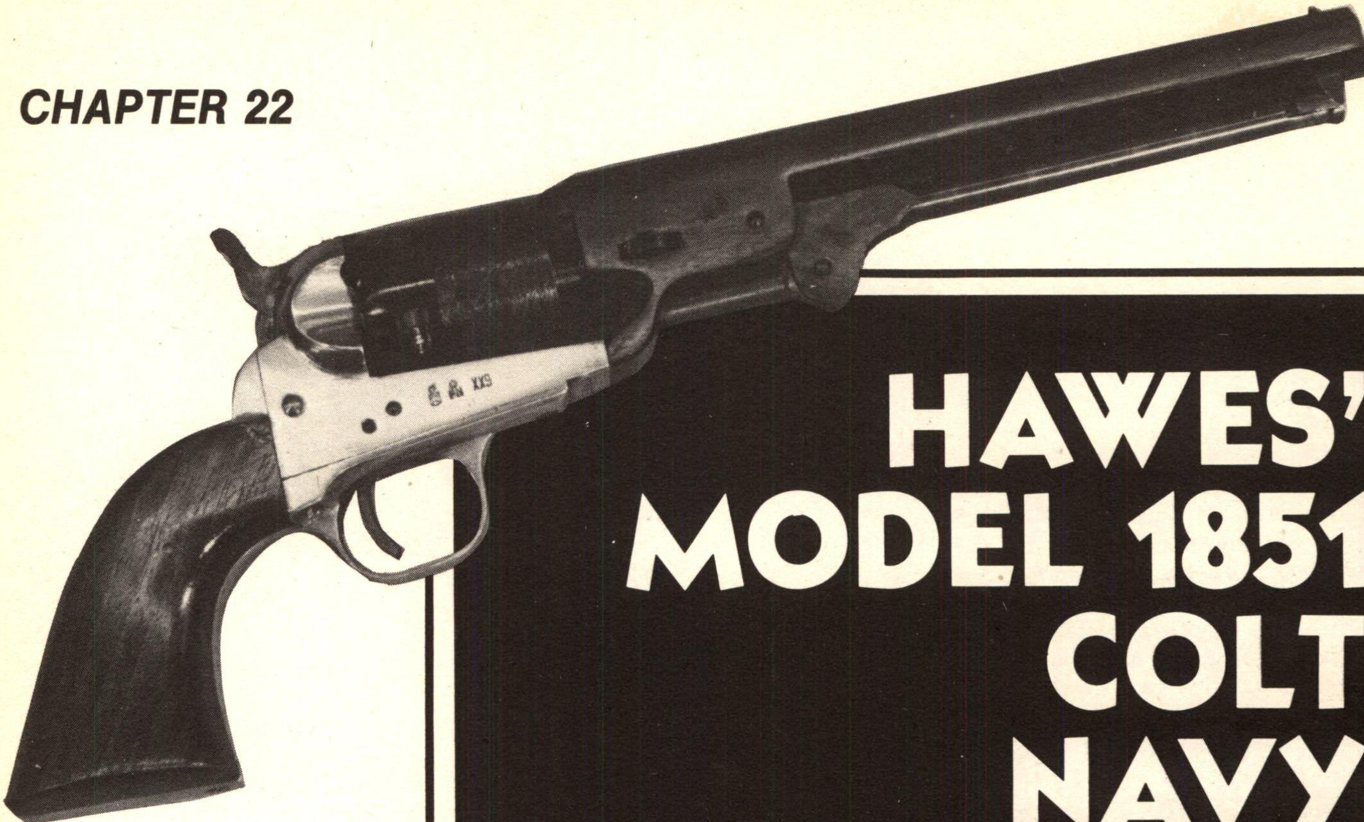
an oil finish on the stock to follow as closely as possible the original stock finishes used by Colonial and English gunsmiths of the period. Sweeden had told me that Watco Danish oil finish produced excellent results and was available in most hardware stores. After purchasing a one-pint can of this oil for $3.58, I was ready to give it a try.

I sanded the stock down to a mirror smooth finish using 280-grit garnet paper. After wiping away all dust, I rubbed a liberal quantity of the Watco oil into the stock, being careful to rub with the grain. After letting the oil soak into the pores of the wood for thirty minutes, I wiped the stock down with a clean, soft cloth. The results were excellent. I applied another three coats over a two-day period and finished the stock by waxing it with paste wax. The Watco oil does an excellent job of bringing out the grain of the stock and is simple to apply.

The last order of business was to add the brass front bead sight. After screwing it down tight and adding a drop of Loctite to make sure it stayed in place, I carefully filed the bottom of the protruding screw flush with the inside of the barrel.

I would estimate that the average kit builder would take about forty to sixty hours to completely build and finish the Sharon English Fowling Piece. Of course, there are those who probably could accomplish it in as little as twenty-five hours. It will take longer to finish than many kits available that require little more than screwing the whole thing together before adding metal and wood finish.

The kit retails for $267.76; however, anytime all-iron furniture is incorporated in a black powder firearm one generally can expect to pay a premium price. Interchangeable barrels for the gun may be purchased for $97 each. This factor alone could make the Sharon the most versatile gun in anyone's collection for all-purpose hunting and even competitive shooting.

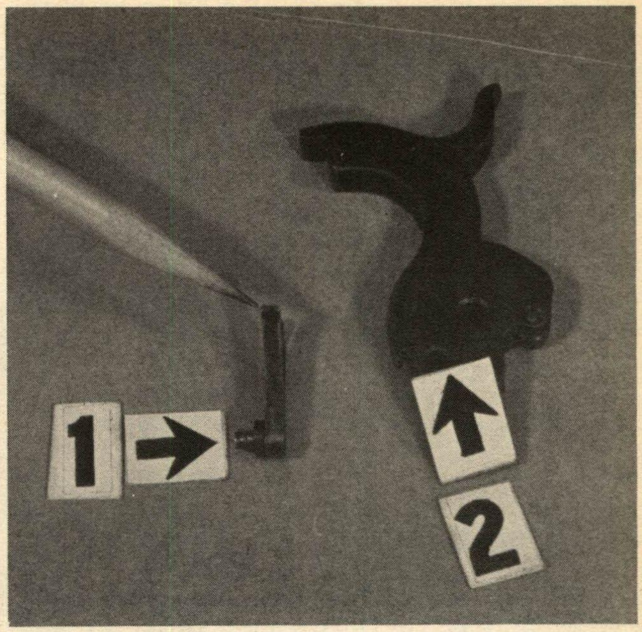


# HAWES' MODEL 1851 COLT NAVY REVOLVER

## Brass Frame Replica In .36 Caliber Of One Of The Most Popular Percussion Revolvers During The Civil War


Hawes furnishes the kit with all parts completely disassembled, as shown. Completed gun, above.

Correct timing is critical to functioning of any revolver. Arrow No. 1 points to pin on hand that enters matching recess in hammer, indicated by second arrow. Pencil point is at top of hand which is critical in length for correct timing.




IF YOU HAD to pick the most popular percussion revolver used by both Union and Confederate troops during the Civil War, the selection would have to be the .36 Colt Model 1851 Navy. There are several reasons for its popularity.

After the failure of the Colt Patterson revolver, Samuel Colt was, for all practical purposes, out of business. The war for Texas independence created a large demand for percussion revolvers, and the combined efforts of Colt, the inventor, and the practical experience of Captain Walker resulted in the Colt Walker Model of 1847, a massive .44 caliber, six-shot, nine-inch-barrel revolver weighing four pounds and nine ounces.

Next in line was a slightly smaller revolver, the Colt Dragoon Model 1848. There are three variations, but all weigh four pounds and two ounces, and are in .44 caliber with 7½-inch barrels. The French word dragoon means a heavily armed, mounted soldier. The revolvers usually were issued in pairs and carried in holsters slung across the saddle, one on each side.

Very few men can walk around with more than four pounds of revolver on their hip. The desire for a lighter version resulted in the Model 1848 Baby Dragoon revolver, and the Colt Model 1849 pocket revolver. In essence, both were scaled-down dragoons in .31 caliber. While the weight was fine, the .31 caliber was not an efficient manstopper.

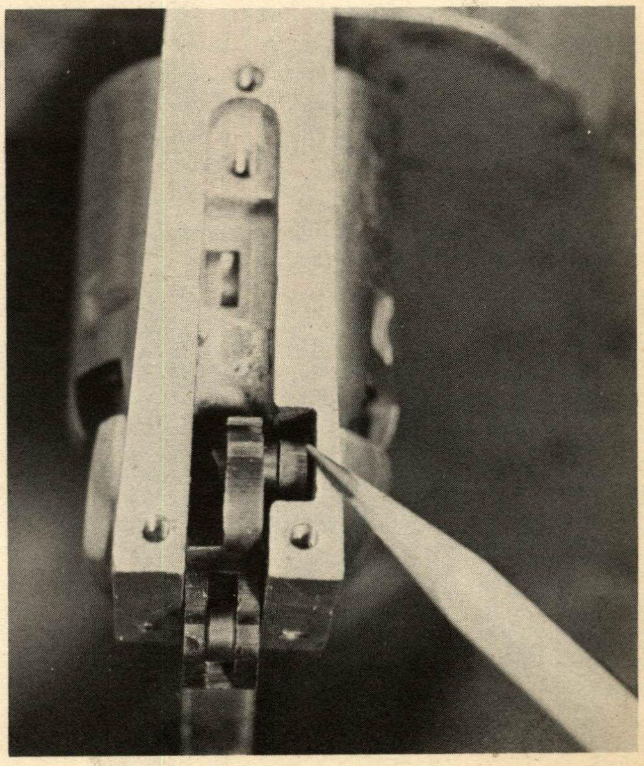
In 1850 Colt hit upon an excellent compromise, the .36 caliber Model 1851 Colt Navy that fired six shots, had a 7½-inch barrel and weighed two pounds ten ounces. Manufactured until 1874, 215,348 were produced at the Hartford, Connecticut, Colt factory and an additional 42,000 were produced at Colt's London, England, factory.

It was an immediate success and the Colt factories steadily turned them out to meet public demand. Primary sales were made to individuals and some state militia units, although the Union purchased 11,696 for issue to the Army and Navy. From 1851 to 1861, the privately purchased revolvers found their way into every section of the country. In fact, in December of 1860 Sam Colt presented a Model 1851 with serial number 95844 to Andrew B. Moore, then governor of Alabama.

If you take the above serial number and add those the Union purchased direct from Colt, even excluding those purchased by individuals during the war, the number of Model 1851s is impressive. Additionally, Union and Confederate purchasing agents bought every available London factory gun. It is impossible to determine exactly how many of this model were directly involved in the war.

Variations of the Model 1851 seem endless. The most authorative book is *51 Colt Navies* by Nathaniel L. Swayze of Yazoo, Mississippi. I first met Swayze at a gun show at Birmingham, Alabama, in the 1950s. He was photographing and gathering data on every Model 1851 available. His book is the result of years of research, and is considered a classic. Even with all this research, odd 1851s still turn up. A friend of mine who lives in Georgia has one, fully authentic with a sixteen-inch barrel, adjustable sights and other odd features. As it was not covered in Swayze's book, nor was any other information available, the gun was photographed thoroughly. During a later visit to the Colt factory, I left

Pencil indicates recess cut in bottom of frame for hand. Hand is shown attached to hammer and entering recess in this upside-down view of assembled gun.



the photos with a long-time employee and close friend. His reply in a letter was that the gun was authentic but no records on it existed, even in Colt's well-known historical department!

The basic Model 1851s were blued steel except for a plated brass backstrap, although some had a steel backstrap. Grips were varnished walnut. As all Colt collectors know, these are only the basic models.

What about brass frames such as the Hawes kit? Well, no known Colt factory versions were made with brass frames; however, like the oddball previously mentioned, the possibility exists that perhaps some test brass frames were made and tested.

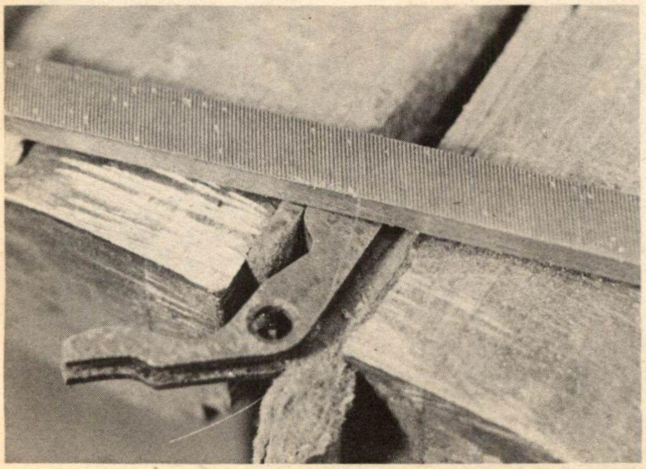
I know from my own research that the Confederate records contained numerous accounts of "brass frames of the Colt Navy pattern." My hometown, Selma, Alabama, had the second largest arsenal in the Confederacy. One section was completely devoted to the rebuilding of small arms, both Confederate issue and battleground recovered. In examining some of the original records, I found numerous references concerning guns being restored to service by the fabrication of replacement parts.

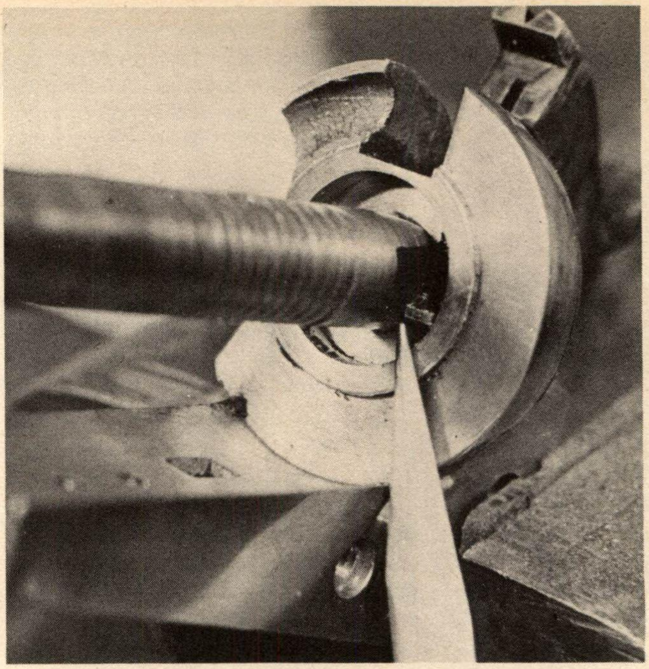
While serving as senior smallarms adviser to the Chinese Nationalist government on Taiwan during the Korean war, we rebuilt, cannibalized and manufactured parts and components to refurbish smallarms from World War II that had been gathered from all over the Pacific. Our mission was to rearm an entire army, and if original replacement parts were not available we manufactured them! Sometimes collectors overlook this fact, and expect everything to be original and fully documented.

There is no doubt in my mind that if a new frame was required to restore an 1851 Colt Navy to duty, one was cast and used. The demand for service revolvers and available casting facilities, plus the abundance of brass that is more easily worked than cast iron can only point to one logical conclusion. Wartime pressures and urgent demand always result in an ordnance officer getting the job done, and the devil take the paperwork!

The Hawes brass frame replica of the .36 caliber Model 1851 Colt Navy is an interesting kit to build. The kit arrives with the gun totally disassembled, and some of the parts will require fitting, and the action must be adjusted and timed. The one-piece walnut grips are oversized and partially inletted. The surprising feature is that the steel and brass exteriors are about ninety percent finished and free of rough casting and machining marks. There are, however, the usual number of burrs to remove.

*Lump on top of bolt must be filed to correct width, as described in text. Note padded vice jaws.*





*Hand, which is at pencil point protruding from recess cut in face of frame, must function with no binding.*

Other plus factors are a detailed set of instructions, an exploded drawing, and a parts list that contains names and prices of replacements should you damage any during construction. An additional brochure in the kit is titled "Loading, Firing, and Cleaning Instructions." Both the instructions for assembly and the brochure should be thoroughly read until you fully understand each step. As the fitting and timing of the action must be done, those parts of the instructions are critical.

As the gun arrives disassembled, perhaps the usual procedure of disassembly of a Model 1851 Colt will be of assistance. Remember that assembly is in exact reverse order of disassembly. Once you are familiar with the disassembly and reassembly sequences, the building of the kit will be easier; you will understand the location of each part and component and its function.

Usual disassembly is as follows. Depress the wedge spring and push and pull the wedge to the left, the muzzle pointed away from you. The wedge is tapered, and in some cases may require a tap with a small block of wood to start it moving. The wedge is stopped by the wedge screw on the left side of the barrel assembly. Pull forward on the barrel assembly and rearward on the frame assembly to separate the two assemblies. Slide the cylinder forward and off the base pin. At this point you have three components: the barrel assembly, the cylinder, and the frame assembly. This is all that is necessary for normal cleaning of the revolver.

For total disassembly, remove the wedge screw and pull the wedge free of the barrel assembly. Do not separate the wedge and wedge spring unless absolutely necessary. Remove the loading lever screw. Pull the loading lever and

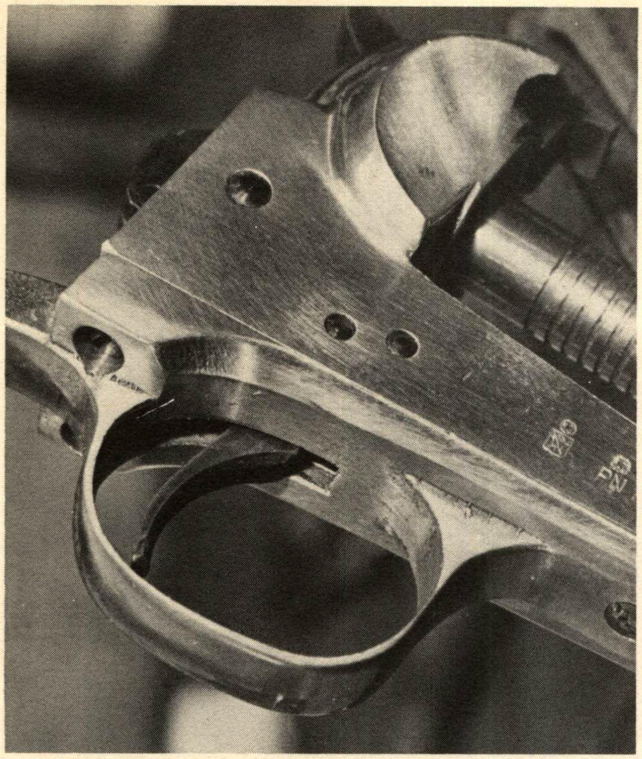


*Photo shows trigger and its recess in frame smoothed up, with bolt and trigger installed to check spacing.*

plunger down and free of the barrel. Remove the plunger screw and separate the plunger from the loading lever. Punch out the loading lever latch pin. This will release the loading lever latch spring. The loading lever barrel latch is dovetailed into the bottom of the barrel and can be driven out with a punch, the same as a dovetailed sight. The front sight screws in on some models, but is staked in others and should not be removed unless necessary. The barrel assembly is now fully disassembled.

The nipples are installed in the kit. If they require removal from the cylinder, be sure you use a proper-fitting nipple wrench. Placing two wooden dowels in a vise, as described in the chapter on the Remington New Model revolver, will help prevent slipping and hold the cylinder secure during removal of the nipples.

Remove the base backstrap screw. Remove the two top backstrap screws. Grasp the one-piece grip and pull the grip and backstrap rearward off the frame. Separate grip and backstrap. With hammer fully forward, slowly remove the mainspring screw and then the mainspring. Remove the front trigger-guard screw and the two rear trigger-guard screws. Pull the trigger guard down and off the frame. Remove the trigger and bolt-spring screw and the spring. Remove trigger screw and trigger. Remove bolt screw and bolt. Remove the hammer screw. Carefully pull the hammer and the attached hand and spring down and off the frame. The hand and hand-spring assembly lifts up and out of its hole recess in the hammer. Do not separate the hand and hand spring. The hammer roller is held to the hammer by a crosspin, but should not be disassembled unless necessary.

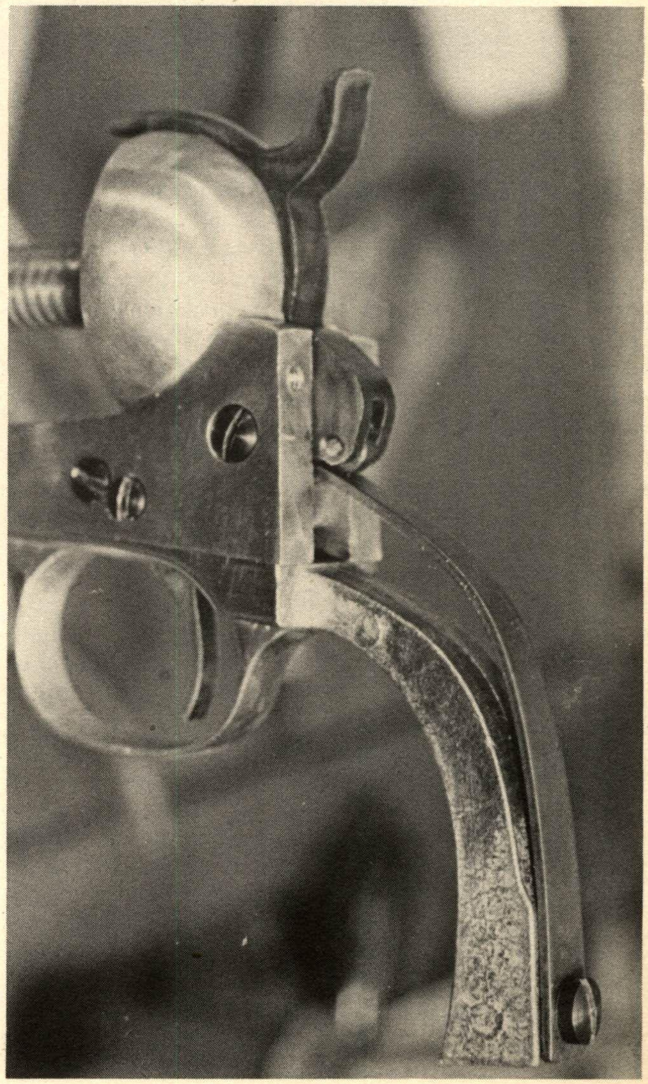
The two locator pins in the front end of the frame are pressed in and should not be removed unless they are broken or bent. The base pin is screwed into the frame and should not be removed unless it is damaged. These parts are assembled in the kit and should not be removed.

By reading the disassembly procedure and studying the exploded drawing in the kit instructions, you should have a good understanding of where each part goes on the gun. Remember that usual assembly will be in reverse sequence. As parts must be fitted in building the kit, the sequence must be modified slightly to accommodate these needs. However, when the kit is completed, follow this sequence.

The first step in building the kit is to obtain a proper fit of the trigger guard to the frame, then a proper fit of the backstrap to both the frame and the trigger guard. All three of these major components are fastened together with screws to form one unit.

Using a magnifying glass, inspect the threads of the screws for burrs. If any are present, hold the screw between your fingers and, with the other hand, hold a small ball of four aught steel wool. Insert the screw threads down into the steel wool, compress the steel wool and twirl the screw back and forth with your fingers. The steel wool will remove the burrs and burnish the threads. It's a good idea to do this on all screws whose threaded holes are in brass. A

*With hammer and hammer mainspring installed on trigger guard, mainspring length and functioning are checked.*



*At this point, rear section of revolver is assembled without grip for inspection and functioning test.*

burr on a screw that will enter brass will damage the threads of the brass hole.

With the screws cleaned, install the trigger guard on the frame. Pull the screws up tight. Now inspect the joint where the two parts meet. Any gap must be eliminated. The junction of the two parts should resemble a fine pencil line.

On this kit the fit was very close, but not quite perfect. I removed the trigger guard and an examination revealed a few rough machining marks on the surfaces of both the trigger guard and frame. With aluminum oxide cloth wrapped around a flat file, each surface was carefully polished. The oxide cloth-wrapped file must be kept flat against the metal surface, maintaining equal pressure on each side and making slow, steady strokes. This same procedure was used on the frame where it joins the trigger guard.

This is strictly a smooth-up operation, its primary objective being to attain as close a fit as possible. Do not try to complete the task in one pass. Use the tool to remove some metal from each part, then assemble and check your progress. It is the same cut-and-try method used anytime you are fitting two pieces together. Two trials were necessary before the two parts mated perfectly. Leave the trigger guard firmly attached to the frame.

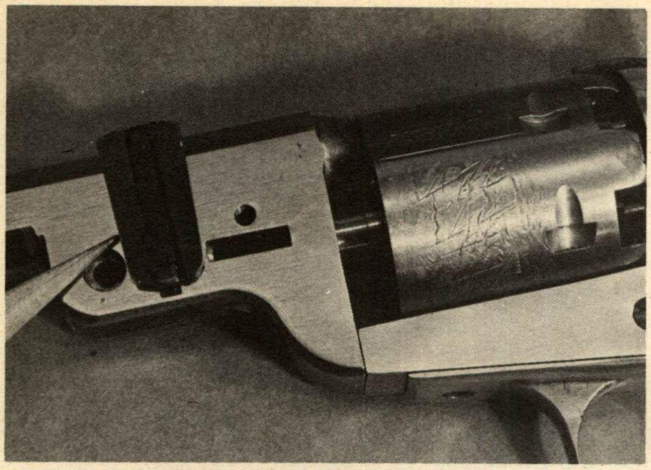
The backstrap receives the same treatment. It must join the frame at the rear and bottom of the trigger guard. Remember to check and burnish the screw threads. On the sample kit the fit at the top of the backstrap required only a light polishing with the aluminum oxide cloth and file tool for a correct fit. The bottom of the trigger guard and the backstrap also required only light polishing.

Before any action components are fitted and installed in the frame, the cylinder should be fitted to the base pin. You will note that the base pin has wide circular cuts in its surface. The cuts serve as storage spaces for black powder residue during firing. Examine the edges of these cuts for any burrs that might prevent the cylinder from rotating smoothly. Use Arkansas stones to remove the burrs, but do not polish the base pin unless its diameter is causing the cylinder to bind. The closer the cylinder fits on the base pin the better, as a sloppy fit will cause a multitude of problems.

Check the rear face of the frame for any burrs that will bind the cylinder. Remove them carefully, as the fit of cylinder to frame face must be close. Do not try to clean up the hand exit hole at this point.

Now examine the cylinder for burrs. On this specific kit the cylinder was clean of all burrs and rough spots and no work was necessary. If any burrs are found, remove them with Arkansas stones. Check the cylinder center hole for burrs. If any are present, use four aught steel wool around a wood dowel to remove them and burnish the hole. Do not use aluminum oxide cloth as this may enlarge the hole and cause a sloppy fit on the base pin.

The bolt that locks the cylinder when the hammer is cocked must be fitted. Examine the bolt and you will find a lump on the top of the front end. This lump enters the bolt stop recess cuts in the cylinder. Try inserting this lump into the cylinder recess cuts. On this kit it would not enter. Secure the bolt in a padded vise and file a small amount of metal off the side of the lump. Turn it over and file an equal amount off the other side. Now try it in the cylinder recess cuts. If it will not enter, place it back in the vise and remove a bit more metal from each side. Check again in the cylinder recess cuts. Three cut-and-try attempts were necessary before the bolt lump would press into the cylinder cuts. Then it was put back into the padded vise. This time a strip of aluminum oxide cloth was used to



*Barrel assembly on frame with cylinder in place. Pencil indicates taper of wedge shown to left of its rectangular slot through barrel assembly.*

smooth up both sides and the top. On this try the bolt entered the cylinder recess cuts easily, without binding or sloppy fit.

Remove the trigger guard and see if the bolt will pass through its cut in the frame. On this kit it would not. The sides of the cut in the frame were carefully widened on both sides until the bolt would pass. The next step is to install the bolt and the bolt screw. Use your finger to push the bolt up and down to check for clearance through the frame. Now slip the cylinder over the base pin and fully to the rear. Slowly rotate the cylinder and press upward on the bottom of the front of the bolt. The bolt should drop into each of the cylinder recess cuts to full depth and lock the cylinder. Check each of the cylinder recess cuts. If the bolt lug fails to enter a recess, check the recess for burrs. If necessary, polish the sides of the bolt stop a wee bit more.

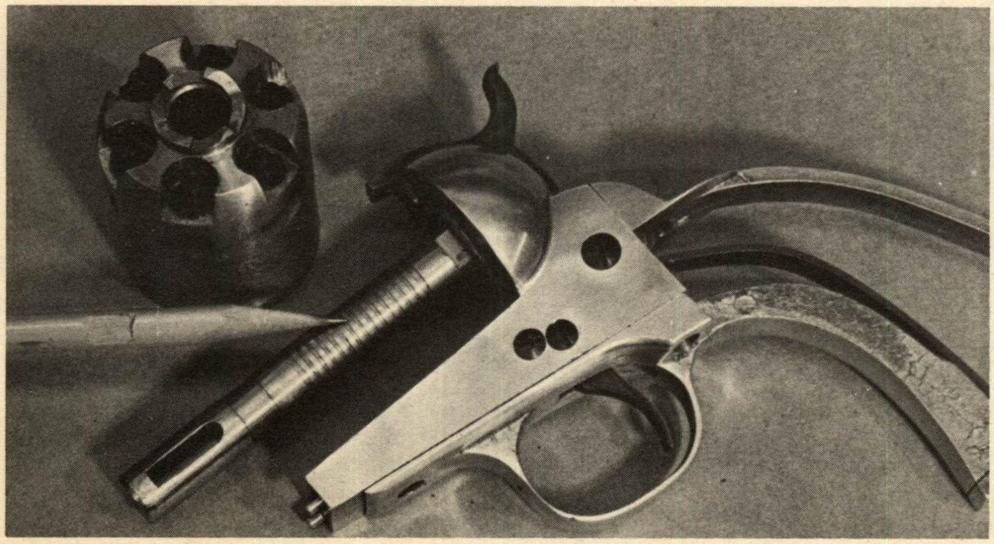
The rear of the bolt has two legs that are activated by a cam pin on the right side of the hammer. With the backstrap removed, install the hammer and hammer screw. Do not install the hand. Use your finger to maintain pressure on the bolt, similar to its spring. As the hammer is pulled back slowly, it should cam the bolt right down. This would be duplicating unlocking the bolt from the cylinder recess cuts to allow the cylinder to rotate. As the hammer reaches its almost-cocked position, the cam pin disengages from the bolt arm, and the bolt spring and bottom of the hammer pin push the front of the bolt up in its slot to engage the cylinder recess cut and lock the cylinder. The hammer then reaches full-cock notch.

It may be necessary to use a small round file on the bottom of the bolt arms to achieve this timing. Right now all you want is to see that the hammer cam and bolt arms mate and function. It is especially important not to file too much at this stage. The final filing and timing can only be done with the gun fully assembled and the action cycled.

Let's stop in the assembly procedure and assume you have completed the gun with all parts fitted except the bolt timing. As you start back with the hammer, the bolt should unlock and free the cylinder for rotation. If it does not unlock, the bottom curve of the bolt has been filed too much and the hammer cam pin cannot activate the bolt. This is the reason for not filing too much initially. When the hammer has passed the safety notch and just before it reaches the full-cock notch, the hand will have rotated the cylinder almost to maximum. The bolt should start up to lock the cylinder. A bit more back on the hammer and the hand should complete cylinder rotation and the bolt engage the cylinder recess cut to lock the cylinder. Only a wee bit more backward movement and the hammer should be in full-cock notch.

This is difficult to describe in such a way that anyone who has never timed an action will fully understand. The backward movement of the hammer starts several components to cycle and each must perform its function in sequence. Timing is easily demonstrated, and I would advise any beginner to let a professional gunsmith do the job while he watches, or have a gunsmith supervise the job. This is the best way to learn.

By following the instructions in the kit, or this description, you can get the gun to function and fire correctly. If study of the parts and instructions are very carefully done, the timing will be even better. However, perfect timing can only be achieved by watching a knowledgeable gunsmith perform the work and explain each step, followed by patience and practice. Actually, about ninety percent of factory revolvers are not correctly



*Pencil points to circular cuts in base pin which provide space for powder residue during firing.*

timed. They function, of course, but only slow and careful hand fitting by a knowledgeable gunsmith can produce perfect timing. The most inexperienced shooter can feel the difference between a hand-tuned and timed revolver and a standard factory version of the same gun.

Back to our assembly. Remove the hammer but leave the bolt installed. Check the trigger, especially the sear. If the sear is rough, very carefully stone it, taking care not to alter the angle. Install trigger and trigger screw. The trigger should work back and forth without binding. If it is rough, polish the trigger screw lightly. Install the trigger and bolt spring. The spring should be a firm fit on both parts but allow full movement of the trigger and the bolt. Occasionally you will find that the arms of this spring are too long and prevent full function of the components. If this occurs, very carefully shorten the offending spring arm a little, then try again. The spring should be as long as possible for full strength, but not bind the part. Also, some springs will have a rough bottom edge that binds a part but can be corrected by carefully stoning the edge slightly round. None of this was necessary on this kit, but I have seen these problems occur.

Now check the hand and its attached spring for burrs. If any are found, remove them with your stones but do not change angles! The tip of the hand should be clean and free of burrs. If any are present, again use your stones but only lightly, as the shape and length of the hand is critical to good timing.

The hand has a built-in pin that fits into a matching hole in the left side of the hammer, just above the full-cock notch. Insert the pin in the matching hole and check to be sure it operates smoothly. The hand should move freely on the side of the hammer, so check for burrs.

Before installing the hand and spring as a unit, shine a strong light up into the recess in the frame. Look for burrs and rough machining marks that would prevent smooth operation. If any are present, remove them with needle files. Do not enlarge the area, just get it smooth.

Push the hand and hammer unit up into the recess. If it binds, stop. Remove the unit, recheck for burrs and obstructions. Ease the unit into place. The hand will come through its exit hole in the frame face. Install the hammer screw.

Now slowly pull back on the hammer. The bolt should start to cam down. Back a little farther and the trigger sear should enter the loading notch on the hammer. Push slightly forward on the hammer to make sure the trigger sear is entering full depth in the loading notch. On this kit it would not enter.

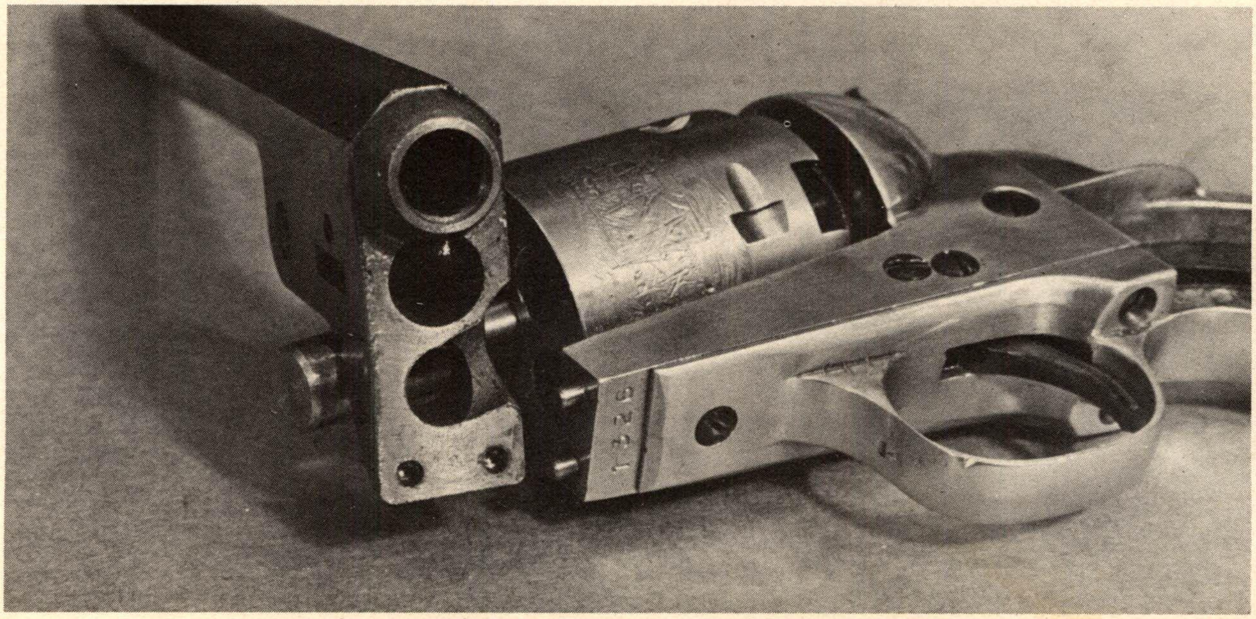
The gun was disassembled and the rear of the trigger sear stoned until it would enter the loading notch easily and to full depth. The gun was reassembled and the inspection continued. Continuing back with the hammer, the hand moved up correctly, the bolt functioned and the trigger sear entered the full-cock notch. This is just another preliminary inspection to assure that the parts are functioning.

Next the trigger guard was installed and pulled up tight. Move the trigger back and forth to be sure its hole in the trigger guard is clearing the trigger. In this case it was correct. If not, the hole would have been enlarged in the trigger guard.

The hammer spring is next on the list. It is secured at the bottom inside of the trigger guard with a screw. The top end must be under the hammer roller before the screw is installed. Once installed, slowly pull the hammer back. The spring will compress and arc. The hammer should reach its full-cock position and a little past at this point. If it will not, the front end of the spring must be carefully shortened a small bit at a time. Do not shorten too much as, after wear, the spring will arc a bit more. If a decision has to be made, leave the spring a bit long.

Now repeat your test cycle of the action. The hammer spring has put pressure on parts and the fit of parts may change. On this kit the hand started binding in its exit hole. The gun was disassembled and the hole smoothed up. When reassembled, the function cycle was fine. The backstrap

*Two permanently attached locater pins protrude from front of frame, fit matching holes in barrel assembly.*



was then installed and the cycle check made without any problems.

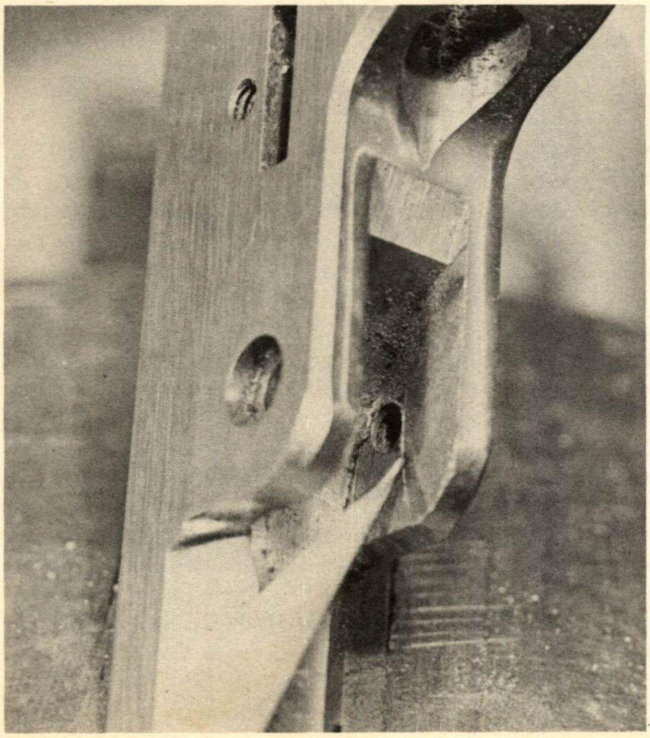
Slip the cylinder over the base pin and fully to the rear. Hold your thumbnail on the base pin in front of the cylinder to hold it back in position. Recheck your cycle. The action was a bit rough but no corrections were made at this point, only noted.

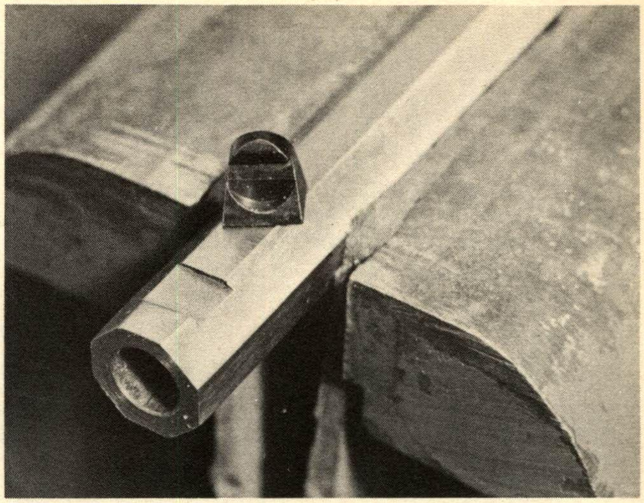
The next job is the fitting of the barrel assembly to the frame. This is best done without the loading lever attached. Note the two locator pins on the front of the frame that are already installed. Also note their matching recesses at the rear of the barrel assembly. No work was required in this area on the sample kit, but quite often there will be a burr where the pins are installed. Slide the barrel on the base pin, cylinder in place, and fully back. There should be no gap at the locator pin area. While holding the barrel back firmly, rotate the cylinder. It should not bind. If it does, the space between the barrel and cylinder is not correct. Do not attempt to correct at this stage.

While holding the barrel back, look through the wedge hole in the barrel assembly and note its alignment with the wedge hole through the base pin. On this kit the hole edge toward the frame was very closely matched, but the front was short on the hole through the base pin. This is normal.

The wedge is tapered and must be fitted correctly. Fully seventy-five percent of the fitting must be on the front end of the base pin hole. First check to be sure the wedge will pass through the barrel assembly. If filing is necessary, file on the muzzle end of the slot. Now slowly start filing the front end of the hole through the base pin, tapering your cut to match the wedge taper. Work slowly, making repeated checks. The width, up and down, is usually correct. It is the length of the slot that must be increased.

*Point of pencil indicates rough burrs left in recess cut in barrel assembly which accepts loading lever.*





*Loading lever barrel latch is fitted into dovetail barrel slot in barrel, similar to front sight assembly.*

When correctly fitted, the wedge should just pass through both slots in the barrel assembly and base pin. It should protrude just enough on the right side for the spring tip to pop up and hold it in place. This has a specific purpose. The wedge is removed constantly to clean the cylinder after firing, and this constant removal results in wear. Being tapered, the wedge enters deeper to compensate for the wear. As a final step, install the wedge screw.

With wedge in place the action was cycled, but showed signs of binding. When the barrel assembly was removed there were signs of the barrel and cylinder scraping. Close examination revealed a rough barrel end. Aluminum oxide cloth was wrapped around a file and the barrel rear polished. When reassembled, the cylinder turned freely. The fit at this point between barrel rear and cylinder front must be close, so polish lightly. Usually this is all that is necessary.

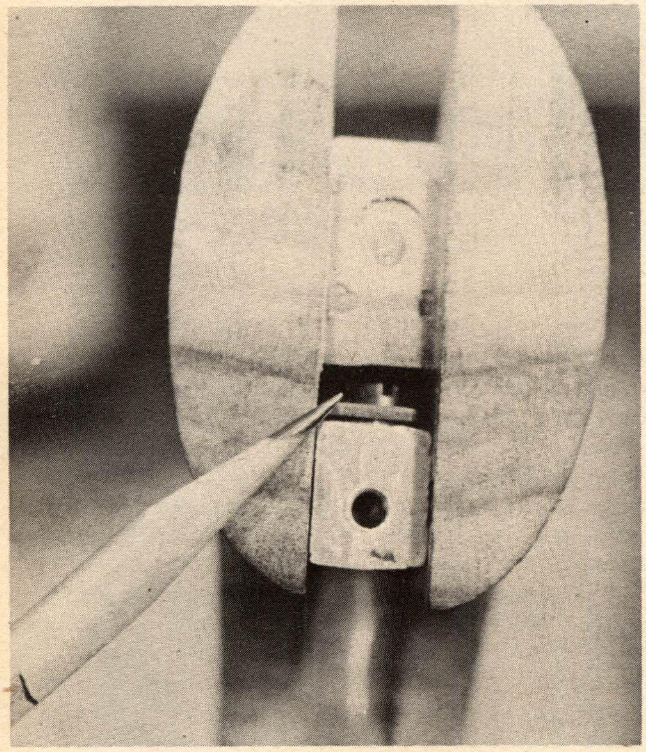
The loading lever assembly is next. The first step is to install the loading lever barrel latch on the bottom of the barrel. This is a dovetail cut exactly like a sight. Use a sight dovetail file to enlarge and taper the slot exactly like a sight. The latch should be a tight fit. Use stones to smooth the latch recess and be sure the barrel latch is exactly centered on the barrel.

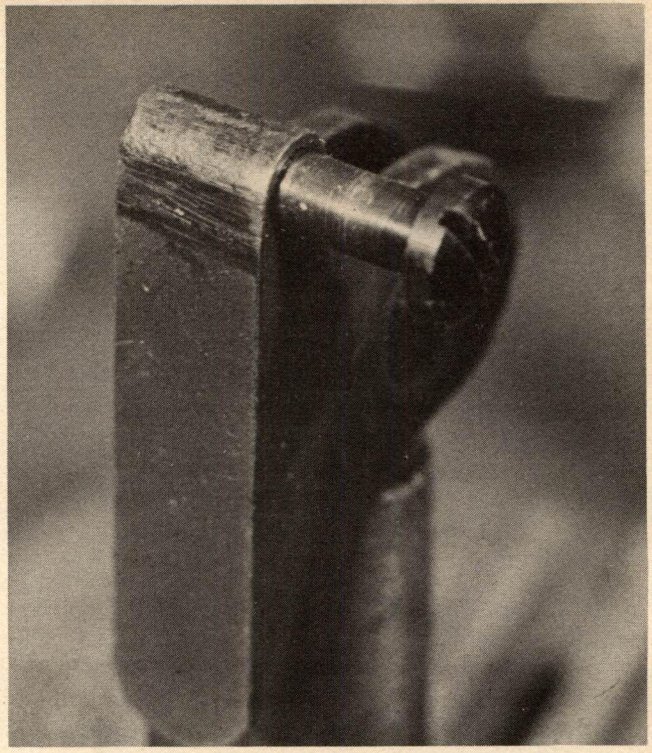
The loading lever assembly comes fitted and color case-hardened in the kit. It requires only assembly in the recess cut in the barrel. First inspect the recess cut. This had a multitude of burrs and machining cuts that had to be cleared up by filing and use of a Dremel Moto-Tool and polishing point.

The screw was checked first by inserting it in the barrel assembly, seating it and working it to assure good thread fit. Next it was tried through the hole in the loading lever. Problem! It would not pass. The threads entered easily but not the body of the screw. The hole through the loading lever leaves little room for enlargement, so it was just polished. The screw still would not pass.

This is a perfect example of how nothing can be taken for granted and automatically assumed to be correct. Each part must be inspected. The fit of any two parts must also be inspected to assure correct function!

*One-piece wood grip is inletted to trigger guard, just touching hammer mainspring screw at pencil, below. At right, loading lever pin would not pass through hole. Screw body is oversize, needs filing.*





The threads could not be altered, nor could the section of the screw near the head that fitted correctly through the barrel assembly. The center section of the screw where it passed through the loading lever hole had to be reduced in diameter. The screw was reinstalled in the barrel assembly and pulled up tight. A scribe was used to mark the screw on the head end, reaching up through the loading lever recess cut in the barrel assembly.

Decreasing the center section of a screw, as this required, appears to present a problem. The first thought is to chuck it in a power tool. Wrong! You will only mar the threads or head and control is difficult. Use a set of plywood vise-jaw protectors. Insert the screw with the top of the jaws level with your scribe mark. Tighten the vise hard and the wood will compress around the screw head and body, holding the screw firm. Now use a pillow file which has safed edges. File around the screw body with the safe edge of the file resting on the top of the plywood. File equally all the way around. If you want to check, loosen the vise and remove the screw. If more filing is required, just be sure you reposition the screw in the plywood recess.

When filing was finished and the screw passed through the loading lever hole, the loading lever was installed. The screw went in full depth and the loading lever was snug but worked freely. The front latch was polished with stones and the lever locked up correctly.

With everything in place, the action was slow cycled. It was necessary to disassemble the gun and stone the top edge of the hand as it was a bit too long. The gun functioned correctly, but the bolt was not lowering enough and was dragging on the cylinder. This was corrected by stoning the top lug down just enough to avoid dragging. A few other small stoning touches on rough parts and the gun cycled perfectly at both slow and rapid rate.

The Colt does not have safety notches cut between the chambers as are found on the Remington New Model and other percussion revolvers. Instead, small pins are installed between the chambers. The bottom of the hammer has a notch to fit over the pins. On this kit, and others, the notch is in the hammer but no pins are installed in the rear of the cylinder. If desired, holes can be drilled and short sections of spring wire stock installed for pins.

The one-piece grip is of very good wood, and although a bit more of a problem to install than two-piece grips, it is worth the effort. No Model 1851 Colt was made with two-piece grips. Ample wood is available and the pre-inletting is correctly aligned.

Remove the backstrap and press the grip forward as much as possible. On this kit it stopped about halfway. Spread some inletting black on the trigger guard, press the grip forward and then remove. Use scrapers and inletting chisels to remove the marked wood. Redistribute the inletting black and repeat. Keep repeating until the front of the grip touches the frame and the bottom touches the hammer spring screw. Stop.

Now repeat the procedure on the backstrap. Remove only enough wood for the backstrap to be flush with the wood rear edges. Now hold this against the frame. You can see where and how much more inletting of the backstrap will be necessary.

When the inletting is completed and the backstrap re-installed, there will be a considerable amount of excess wood

extending past the backstrap and trigger guard. Use a four-in-hand rasp to remove the major part of the excess wood.

Now switch to the smooth-cut section of a four-in-hand rasp and bring the excess wood down to almost flush with the metal. Switch to metal files. Use these for the final shaping, removing rasp marks and smoothing up the wood.

Switch to aluminum oxide cloth around files for sanding. While the brass is polished, it is better to touch it with the aluminum oxide cloth to assure a correct wood to metal fit. The brass can always be repolished. Finish up the grip with four aught steel wool.

Remove the backstrap and grip. Separate the two and reinstall the backstrap on the frame. The original Model 1851 grips were varnished. To duplicate the finish, use Tru-Oil or G-96, leaving the finish high gloss.

As there is no precedent on brass frame Model 1851s, you can high polish with the Dremel Moto-Tool and polishing bobs. Just use light strokes and No. 555 compound. If desired, the brass can be given a soft sheen with four aught steel wool.

The steel parts should be blued. The simple solution is to remove the barrel and cylinder and have them commercially blued. The loading lever and hammer are color case-hardened and should not be changed. As the base pin should not be removed, use Birchwood Casey's Muzzle Loading Blue to finish this part. All screws are blued when the kit arrives.

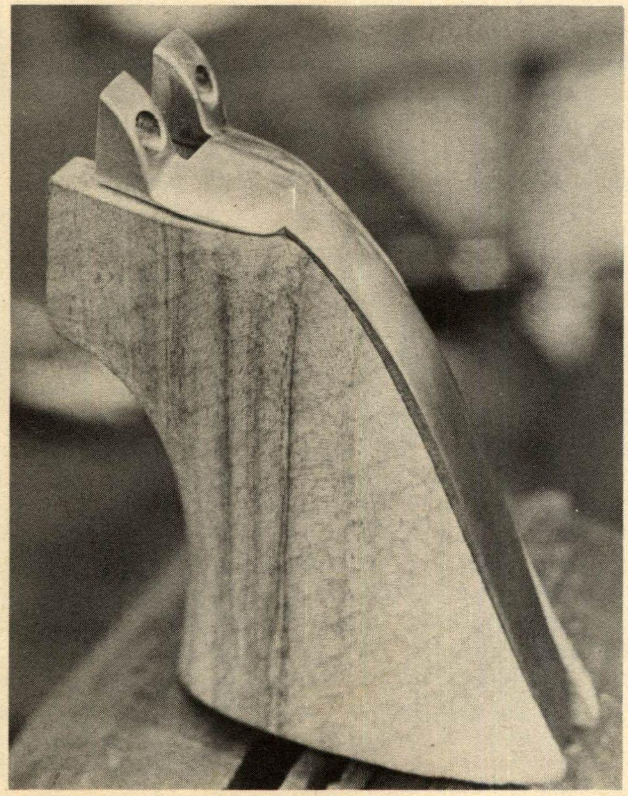
Reassemble the gun. Remember to clean the grip of excess finish. Lightly lubricate all moving parts and clean the chambers and bore. Make the percussion cap-only initial test fire. If all is well, use blank charges next, then a light load in each chamber. Work up to your normal load, a few more grains of powder each time.

With all tests completed and any corrections or adjustments taken care of, the job is done.

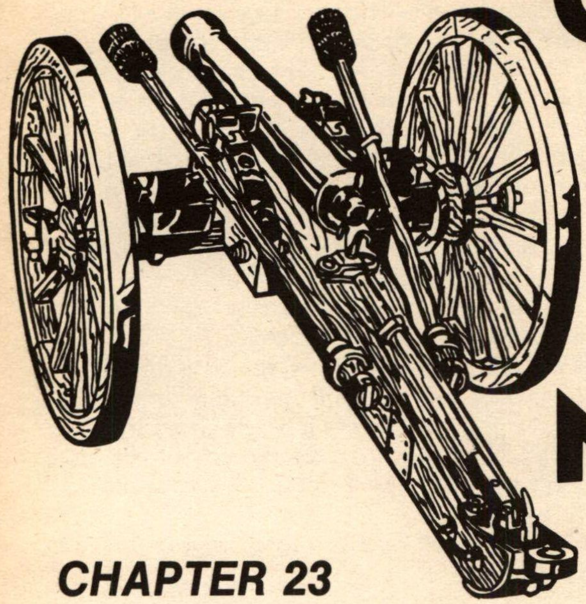
The Model 1851 Colt Navy is the basis of all Colt percussion models and you will also find many of its features in the well-known Colt single-action cartridge revolver. The .36 caliber, if traced through all converted revolvers, will lead directly up to the .38 special and .357 magnum cartridge!

The Model 1851 Colt Navy is truly a classic in American handgun history!

*Left side of completed Hawes .36 caliber Colt Model 1851 with barrel and cylinder hot blued, brass frame finished to high gloss.*



*Considerable grip inletting and shaping was necessary to get professional appearance to gun.*



CHAPTER 23

# CONNECTICUT VALLEY ARMS' NAPOLEON III CANNON

## A Scaled-Down, Reasonably Priced Model That Solves The Problems Of Most Would-Be Cannoneers

THERE COMES a time in every black powder shooter's career when his thoughts turn to the largest of muzzleloaders, the cannon. You have but to see one before the spark of interest turns into the desire to learn more about them and yearn to own one.

Originals, other than those in parks, are few in number and cost thousands of dollars if in working condition. Just an original barrel is difficult to find, and expensive. Even if these obstacles are overcome, you are faced with finding a place to store the cannon. As to firing it, there is a shortage of places where they can be safely fired.

There are several companies that offer modern reproductions of the originals, but the price tag is healthy, to say the least. Again, even if money is no problem, the storage space and safe range problems are still present.

The obvious answer for most is a scaled-down model; until recent years, however, only a few specialty companies offered them. While solving the price, storage and range problems, construction required considerable tooling and knowledge.

The CVA Napoleon III Cannon kit is a close-reproduction, scaled-down model carrying a price tag well within the reach of the average black powder buff. Furthermore, it is not a tabletop miniature. The completed gun weighs eighteen pounds, has an overall height of 12½ inches, and is two feet three inches in length. It has a .75 caliber bore, 14½-inch fully functional barrel, and wheels just a half inch shy of one foot in diameter. Thus, the storage problem is solved and any rifle range is fully adequate for safe firing. Projectiles are no problem; the recommended .69 caliber round lead ball is easily cast and, using the standard 50-grain charge of FFg powder, the range and accuracy are impressive. It is definitely not a toy!

Without exception, anyone seeing the large box containing the kit will be impressed. While the kit contains over two hundred individual parts, the only necessary tools are a pair of pliers or small adjustable wrenches, drills in sizes 1/16, 5/64, 1/8 and 1/4 inch, plus a hand drill, a screwdriver and your personal selection of finishing material. An excellent book of instructions, with exploded drawing and parts list, takes you step-by-step from kit to the shooting range.

It's one of those projects that the whole family can enjoy. My teen-aged daughters joined in the project, and my wife has selected a place by the fireplace for its home when not being used. It can be assembled in from four to six hours, but this is insufficient; adequate time should be taken to work slowly, enjoy the construction and turn out a quality finished project.

The history of the Napoleon III is as fascinating as the kit. Napoleon Bonaparte is well known to every high school student. In 1795 he had risen to the rank of brigadier general. On December 2, 1804, he crowned himself Napoleon I, Emperor of France. His only son, born in

1811, was Napoleon II. During his reign as emperor, he placed his brother, Louis Bonaparte on the throne of Holland as king.

Charles Louis Napoleon Bonaparte, the son of King Louis Bonaparte, was born in 1808. In 1836 he followed in his uncle's footsteps in an attempt to become head of the French government, but failed. In September of 1848 he was elected president of the Democratic Republic of France. In 1851 he overthrew the constitution, and in 1852 assumed title as the second Emperor of France, Napoleon III. The cannon is named after him, and is not the third model of a cannon designed by the first Napoleon.

In general terms, a cannon is a firearm too large to be held and fired by an individual. Like all terms there are a few exceptions, and there are no hard and firm specific definitions for the different types of cannon. There are, however, three general types.

The mortar probably was the first type of cannon. While it varies in styles and shapes, all mortars have one thing in common. They fire a projectile high into the air in a long curving trajectory similar to a half circle. While range is less, this high trajectory allows the projectile to pass over such obstacles as hills, walls, etc., and plunge down at the end of the arcing trajectory onto the target.

The second type is commonly called a gun. If the bore has lands and grooves it is sometimes called a rifle. Regardless of the name, its primary purpose was high velocity and a flat trajectory for aiming and firing directly at a target.

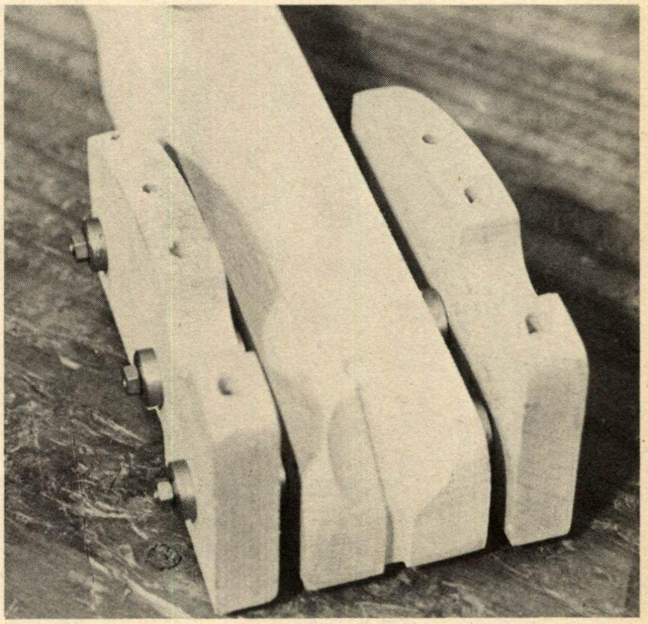
The third type, invented by the Dutch, is the howitzer. It basically is a cross between the mortar and the gun and retains some of the features of both types. It can be used for either direct or indirect fire. The Napoleon III is a howitzer.

The Napoleon III attained its fame for two reasons: First, a howitzer is the most versatile of the three types; secondly, it was light in weight in comparison to earlier types, was highly mobile and capable of two to three shots per minute firing a twelve-pound projectile up to 1600 yards.

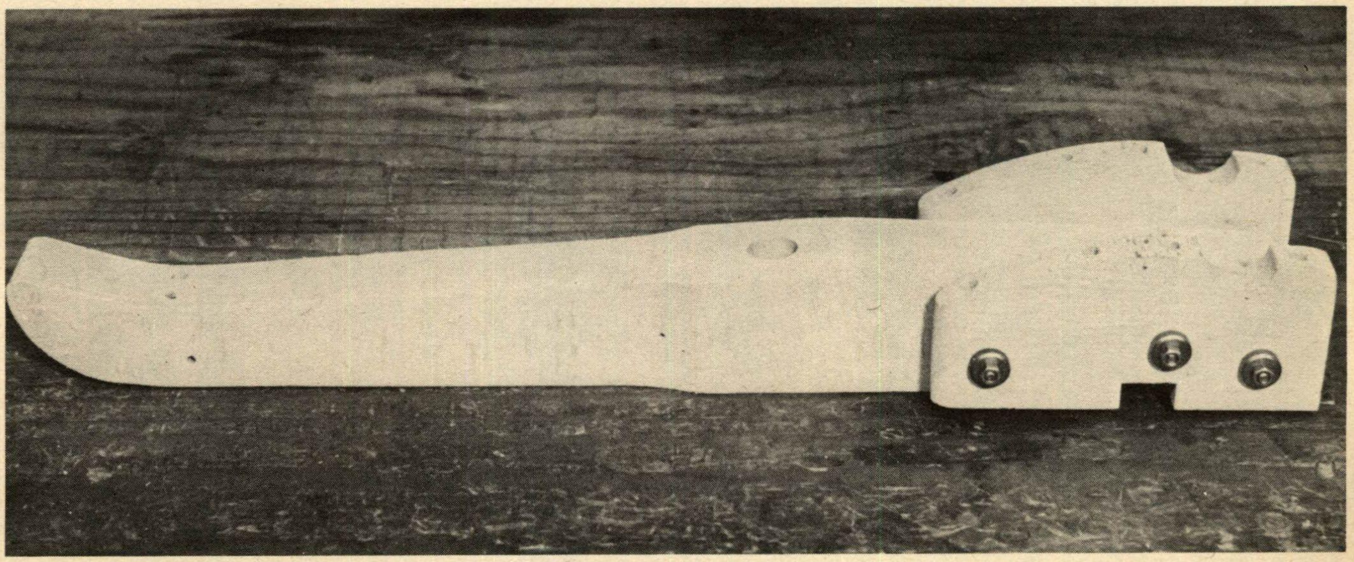
In 1857 the United States adopted a version of the Napoleon III to replace the earlier and heavier model 1841. While the correct designation is model 1857, the name Napoleon was more common. Oddly enough, only five were cast until 1861! By the end of the war, the Union had produced 1156 and the Confederacy had produced 630 Napoleons. The Confederate version differed primarily in the omission of the flared muzzle end. On both sides it practically dominated field artillery. Although both sides produced some rifled bores, the majority were smoothbore.

Since both sides produced more powerful artillery with rifled bores, why was the Napoleon so predominant on the battlefields? Terrain played an important role, as the full potential of the more powerful and more accurate artillery could not be utilized in the rugged areas. But military tactics were the deciding factor, as the Napoleon was highly

*End view of carriage trail and side plates.*



*Wood and metal parts of the CVA Napoleon III cannon are close to original, except in size. First step in construction is putting together carriage trail and wooden side plates, shown from right side.*

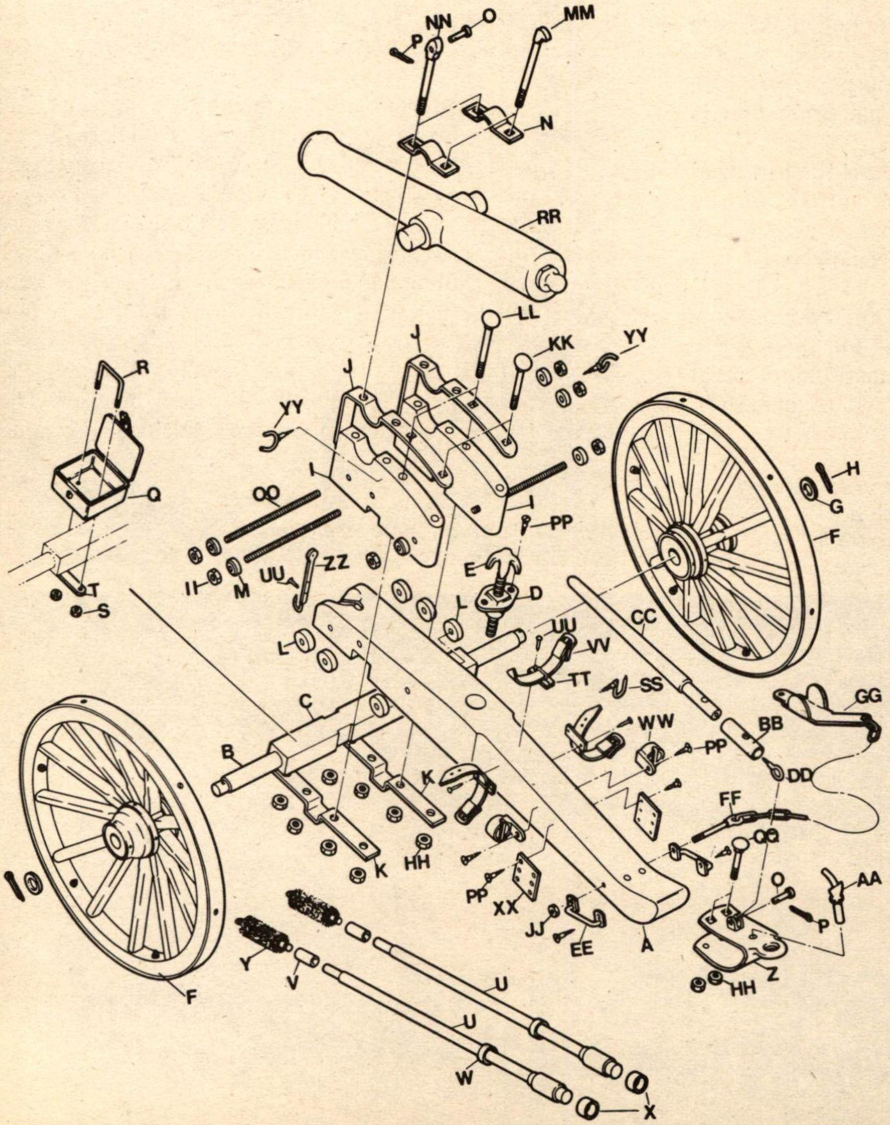


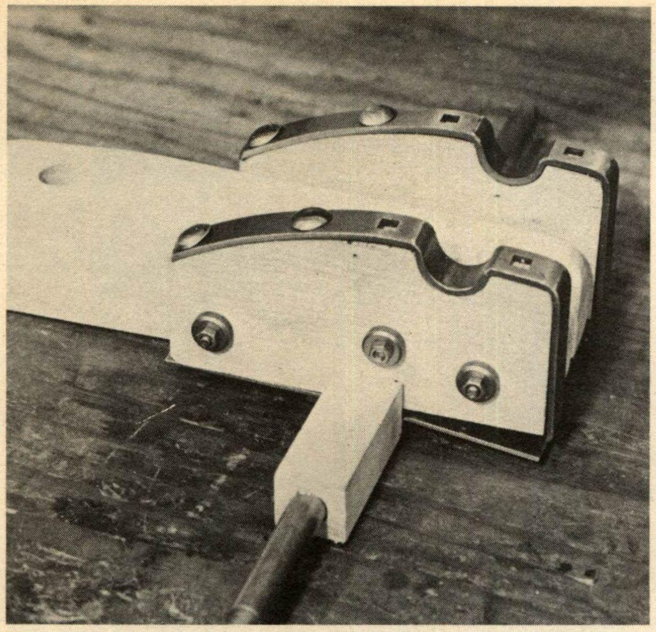
mobile, had a rapid rate of fire and, most of all, could utilize a variety of projectiles.

The word "shot" is the correct term for the solid, round iron ball. With a 2½-pound powder charge and twelve-pound shot, the full-sized Napoleon had a 323-yard range at zero degrees elevation. With one degree elevation range was 620 yards, and at five degrees 1680 yards. Its primary use was at massed troops and other artillery up to a 2000-yard maximum.

The word "shell" is the correct term for a hollow projectile that is filled with powder and equipped with a time fuse to explode the shell. With a two-pound powder charge at zero elevation, the Napoleon's range was three hundred yards, time of flight being three-quarters of a

| Letter | Part | Part # |
|---|---|---|
| A | Carriage Trail | 17100 |
| B | Metal Axle Rod | 17110 |
| C | Wooden Axle | 17120 |
| D | Elevating Screw Collar | 17130 |
| E | Elevating Screw | 17140 |
| F | Wheel (Assembled) (2) | 17160 |
| G | Wheel Washer (2) | 17170 |
| H | Wheel Cotter Pin (2) | 17180 |
| I | Wooden Side Plate (2) | 17200 |
| J | Trunnion Plate (2) | 17210 |
| K | Bottom Plate (2) | 17220 |
| L | Inside Trail Washer (6) | 17230 |
| M | Outside Trail Washer (6) | 17240 |
| N | Trunnion Top Plate (2) | 17250 |
| O | Steel Pin (3) | 17260 |
| P | Small Cotter Pin (3) | 17270 |
| Q | Ammunition Box (2) | 17300 |
| R | Ammunition Box U-Bolt (2) | 17310 |
| S | Ammunition Box U-Bolt Nut (4) | 17320 |
| T | Ammunition Box U-Bolt Bottom Plate (2) | 17330 |
| U | Wooden Ramrod (2) | 17400 |
| V | Threaded Ramrod Tip (2) | 17410 |
| W | Narrow Ramrod Sleeve (2) | 17420 |
| X | Wide Ramrod Sleeve (2) | 17430 |
| Y | Ramrod Brush (2) | 17440 |
| Z | Towing Pintle | 17500 |
| AA | Handspike Pin | 17510 |
| BB | Handspike Metal Collar | 17520 |
| CC | Wooden Handspike | 17530 |
| DD | Handspike Screw Eye | 17540 |
| EE | Grab Iron (2) | 17600 |
| FF | Chain Ring Bolt | 17610 |
| GG | Chain & Wheel Chock Assembly | 17620 |
| HH | Large Nut (10) | 17700 |
| II | Side Plate Through Bolt Nut (6) | 17710 |
| JJ | Chain Ring Nut | 17720 |
| KK | Short Trunnion Plate Bolt (2) | 17800 |
| LL | Long Trunnion Plate Bolt (2) | 17810 |
| MM | Rear Trunnion Clamp (2) | 17820 |
| NN | Front Trunnion Clamp (2) | 17830 |
| OO | Side Plate Through Bolt (3) | 17840 |
| PP | Steel Wood Screw (18) | 17850 |
| QQ | Towing Pintle Bolt (2) | 17860 |
| RR | Barrel | 17900 |
| SS | Trail Bucket Hook | 17910 |
| TT | Leather Strap Plate (3) | 17920 |
| UU | Brass Brad (9) | 17930 |
| VV | Leather Strap (3) | 17940 |
| WW | Ramrod Pocket (2) | 17950 |
| XX | Wear Plate (2) | 17960 |
| YY | Ramrod Bracket (2) | 17970 |
| ZZ | Front Bucket Hook | 17980 |





*Trunion plates and rear trunion bolts assembled, along with wooden and metal axles with bottom plate attached.*

second. At one degree of elevation the range was 615 yards, time of flight 1¾ seconds. At 3.45 degrees of elevation the range was 1300 yards and time of flight five seconds. By varying the elevation and adjusting the fuse – in one second increments – the Napoleon could produce point-of-impact detonation, air bursts over troops, and even delayed detonation after impact.

The word "cannister" is the correct term for a projectile containing a large number of steel balls of approximately one inch in diameter. Maximum effective range was five hundred yards, and when range decreased to two hundred yards a double charge was used. It was, in effect, a massive shotgun that literally mowed down advancing troops!

The Napoleon did not use loose ammunition, except on rare occasions. The projectile was strapped to a sabot, usually a round piece of wood. The powder charge was in a flannel cartridge bag attached to the sabot. This is called fixed ammunition. When rammed down the bore, a pick inserted through the touch hole was used to pierce the bag.

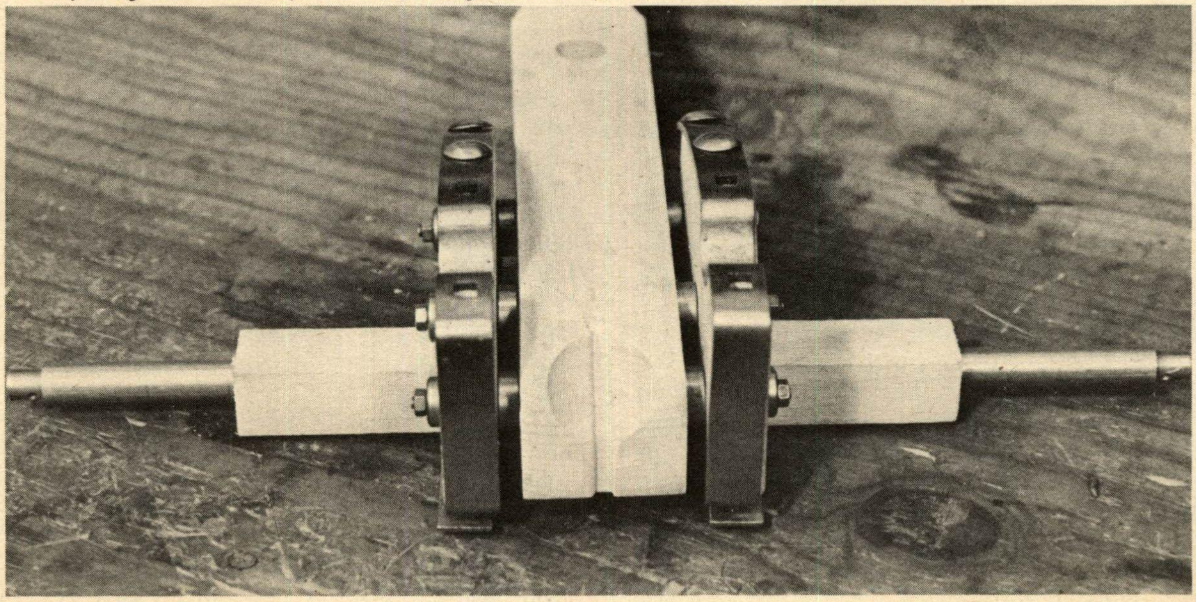
A primer, consisting of a thin copper tube filled with a fast burning fuse composition, was inserted into the touch hole. A rough wire ran through the top of the primer and was surrounded by a composition similar to the head of a common wood match. A lanyard hooked to the wire was pulled and, as the rough wire passed through the primer, it ignited the surrounding composition which, in turn, ignited the fast-burning fuse and then the powder charge. The correct term for the touch hole on a muzzleloading cannon is "vent hole." The friction primer eliminated use of the old fuse or loose powder ignited by a flame.

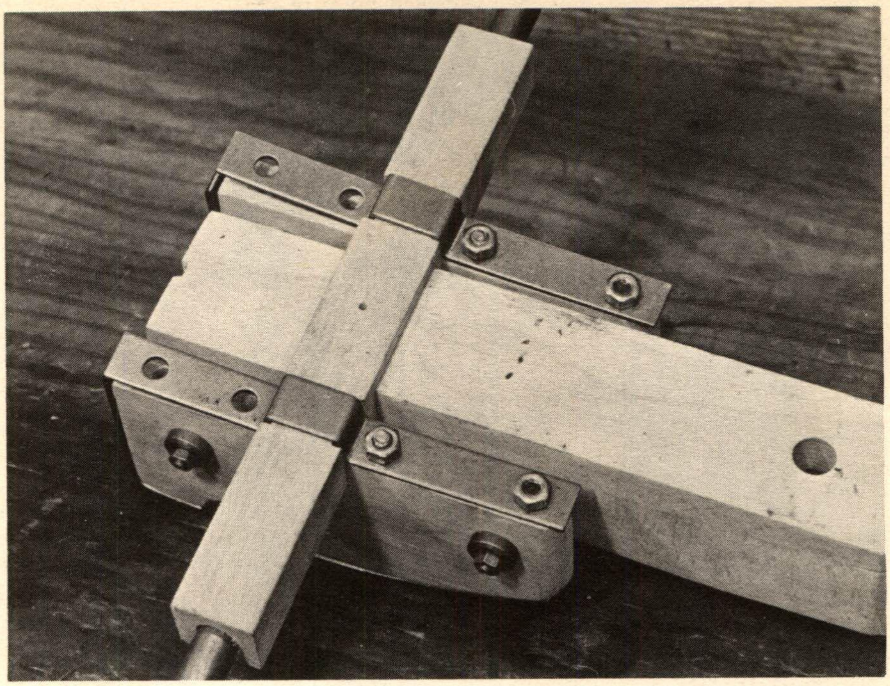
With just this limited and simplified explanation, it becomes clearer why the Napoleon gained its fame. The time fuse for exploding shells was just a section of exposed powder composition, cut to one second increments and ignited by burning gas from the main powder charge. To those who desire more detailed information, I highly recommend Harold L. Peterson's excellent book *Round Shot and Rammers,* and the U.S. National Park's booklet *Artillery Through the Ages,* both available from Dixie Gun Works.

Artillery is a fascinating subject, and the more you study and learn the more interesting it becomes. While primarily a small arms specialist when in the Army Ordnance Corps, my secondary specialty was artillery. I have studied, repaired and fired everything from the British .55 caliber antitank rifle up to a twelve-inch Japanese coastal artillery gun, plus all United States' artillery from the old 37mm antitank gun to the big eight-inch gun. I think every gun buff secretly yearns to fire one of these really big bores!

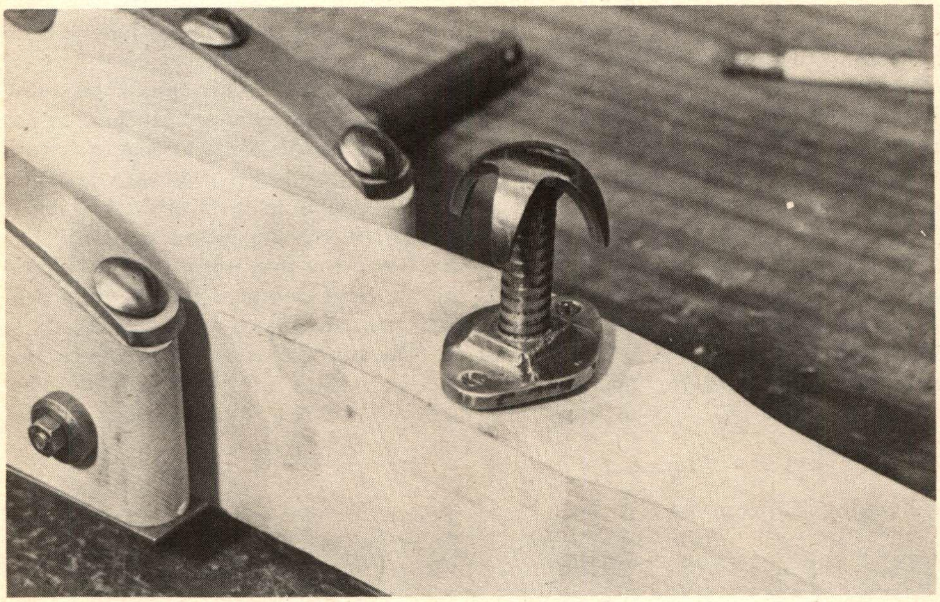
Muzzleloading cannon are rapidly becoming an important part in the rebirth of black powder. The functional, scaled-down versions of muzzleloading cannon

*Note spacing between side plates and carriage trail in this rear view of trunion plate assembly.*





*Bottom view of assembly with lock nuts holding bottom plates.*



*Elevating screw collar installed with elevating screw in place.*

have just begun to appear, and it is only a matter of time before more reproductions become available. This will result in an even greater need for the services of black powder gunsmiths. The terminology of cannon components differs from those of rifles, shotguns and handguns; however, it does not take long to learn them and will not present a major problem.

The CVA Napoleon III Cannon kit is an excellent place to start. As with all kits, the instruction manual should be thoroughly read and studied before any construction begins. The exploded drawing and the parts list should receive a double dose of study and examination. Most of the names actually explain what the part was used for on the original, full-size cannon.

After this period of study, remove the parts from the kit and lay them on a large table or on the floor. Examine each part, study the exploded drawing and parts list until you can identify each one. The large photo of the completed kit that is printed on the container will also help you understand where and how parts fit on the kit.

On a rifle or shotgun the stock supports the barrel and other components. On a cannon, the stock is the carriage trail; break the term down: it carried the barrel and was trailed behind the horses that pulled the cannon. This is just an example of how studying the part's name and a bit of thought can result in a better understanding of a part's use and purpose.

The carriage trail is the backbone of the CVA kit. Everything is attached to it in one way or another. Assembly is just a matter of attaching each of the parts and pre-assembled components to it in the correct step-by-step sequence.

The first parts to be attached are the two wooden side plates, whose purpose is to eventually support the barrel.

Two threaded bolts pass through pre-drilled holes in the side plates and carriage trail. The side plates do not fit flush against the carriage trail. A large, thick washer is placed on each of the bolts on both sides of the carriage trail as spacers.

Start the assembly by first trying all bolts through the pre-drilled holes. On this kit they were a good, snug fit. Now check the four nuts that fit on the ends of the two bolts to be sure the thread fit is correct, just as with any other kit. With all in order, push the two bolts through the carriage trail, leaving the extension equal on both sides. Next slip the large washers and inside trail washers over the bolts and up against the carriage trail. Hold one side of the bolts steady and slip one of the wood side plates over the bolts. Now install the outside trail washers on the bolt up against the wooden side plate. Just start a nut on the end of each of the bolts; you only want to prevent the side plate from falling off. Now install the other side plate, washers and a nut on each bolt. Tighten the nuts equally and firmly.

The two large rods that stick out on each side of the barrel are called trunnions and support the barrel. These fit on top of metal reinforcement strips on top of the wooden side plates and are called trunnion plates. Again, an example of part name explaining its purpose and position. The steel trunnion plates, pre-formed to match the wooden side plates, go on next. Don't worry if they do not fit perfectly when placed on the wood side plates; the bolts will pull them down tight for a close fit. Before the bolts can be installed, however, the axle has to be fitted to the carriage trail as the two bottom steel plates fit over the axle to secure it in place, the bolts passing through trunnion plate, wood side plate and bottom axle plate with a nut on the bottom to pull the bolts up right.

Before assembly, check the trunnion plate bolts closely. Note that there are two long ones and two short ones and that the heads have a square section underneath to prevent turning. Also, the outside of the heads of the bolts are beveled. The long ones go toward the muzzle, the short ones to the rear and the beveled heads match the contour of the trunnion plate. This is actually easier seen and understood than explained. Remember to check the thread fit of bolt and nuts.

Start assembly by placing the wooden axle in place on the bottom of the carriage trail and side plate. It is pre-inletted and requires only a light tap to seat it in place. Now slip the metal axle rod through the wooden axle. This can be done before or after installing the wooden axle. Now check the pre-drilled holes through the top of the side plates with the bolts. They passed through easily on the kit. In the event that they do not pass, just clean up the holes with a small round file. Check the fit of bolt threads and nuts.

It is easier if you work on one side plate at a time. Set the trunnion plate on top of the wooden side plate. Install the long, front trunnion plate bolt through the trunnion plate, wood side plate and bottom axle plate, being sure the beveled head of the bolt is correct. Now install a nut and make just one turn to hold the bolt. Switch over to the other side plate and repeat. This will hold the axle in place while you complete the installation. Now switch to the short, rear trunnion plate bolts. Install them the same way, taking care to align the beveled heads. Tighten the four nuts, but not too snug as two more bolts will pass through the trunnion plates, wooden side plates and bottom axle plate when you later install the barrel.

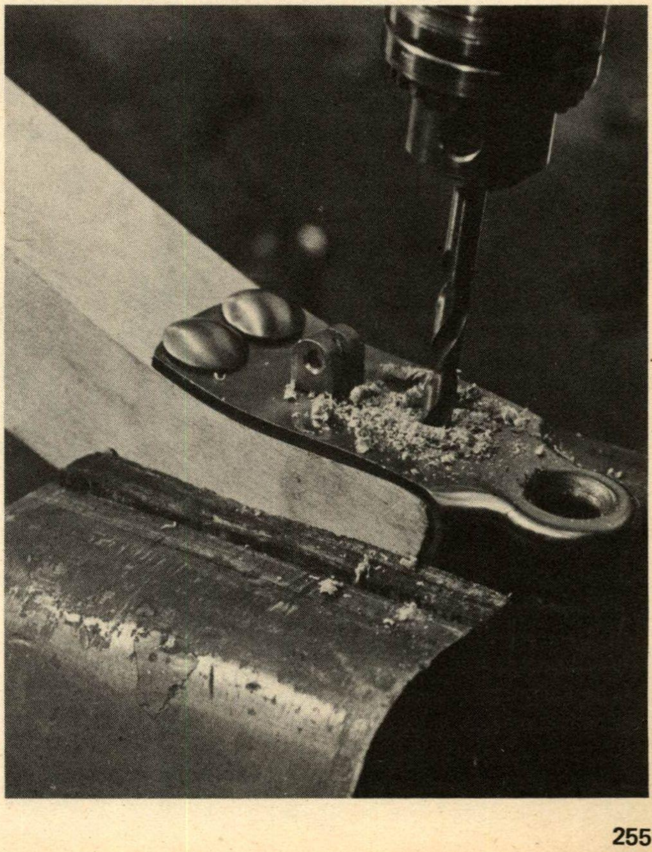
The instructions call for the installation of the bucket hook next, and I followed the instructions. This is one place where I disagree with the assembly sequence; the little hook was continually in the way during the rest of the assembly, and it can best be installed just before the barrel. On the original gun it held a water bucket, as a wet sponge was used after firing to swab the bore and prevent lingering bits of burning powder bag from igniting the new powder charge as it was rammed down the bore. On the kit, it went right into place with no problem.

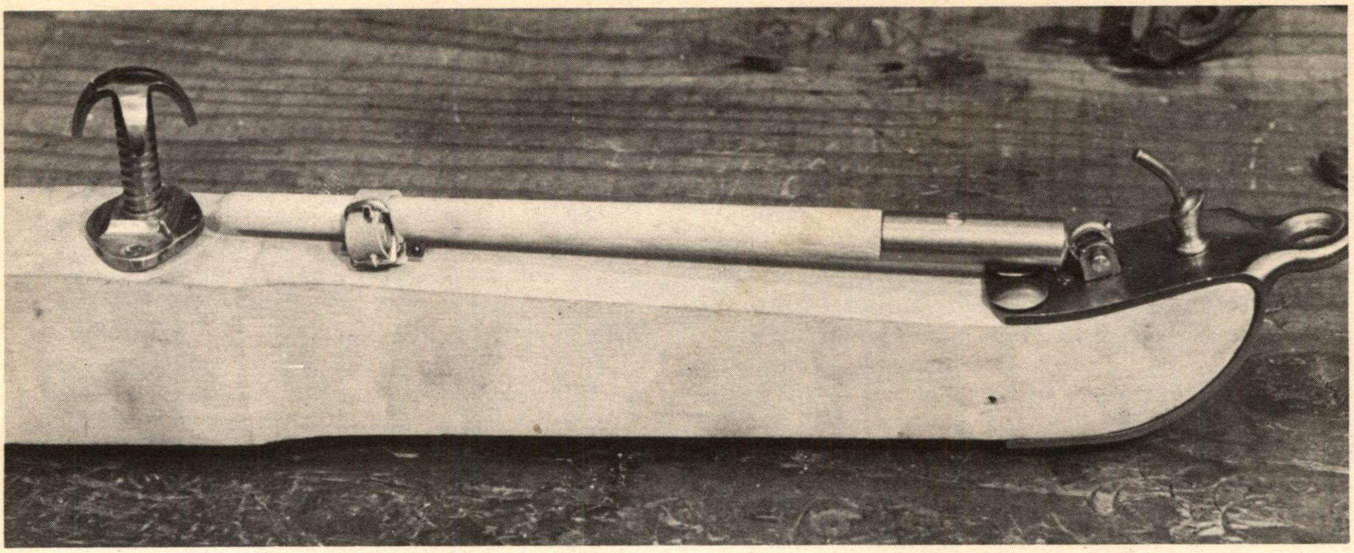
The elevating screw collar goes on next. It is threaded to accept the elevating screw, which passes through a clearance hole in the carriage trail. In use, the barrel knob rests on top of the screw; the barrel purposely balanced with more weight on the breech end. By turning the screw up or down, the muzzle is lowered or elevated for range. Installation requires the drilling of two small 5/64-inch pilot holes to accommodate the two wood screws that secure the collar to the carriage trail, then insertion of the elevating screw.

The towing pintle is next placed on the rear end of the carriage trail and tapped up snug with a piece of scrap wood. It was an excellent fit. Two towing pintle bolts pass through both sides of the metal towing pintle and the wood of the carriage trail. Two nuts secure the bolts and should be pulled up tight.

The handspike appears to be just an unnecessary rod on top of the carriage trail, so what is the purpose of the handspike pin? If you examine the large photo of the

*The towing pintle has been installed at this point as handspike pin hole is being drilled to fit.*





*Handspike, handspike pin and handspike holding strap have been attached to carriage. Appearance is authentic.*

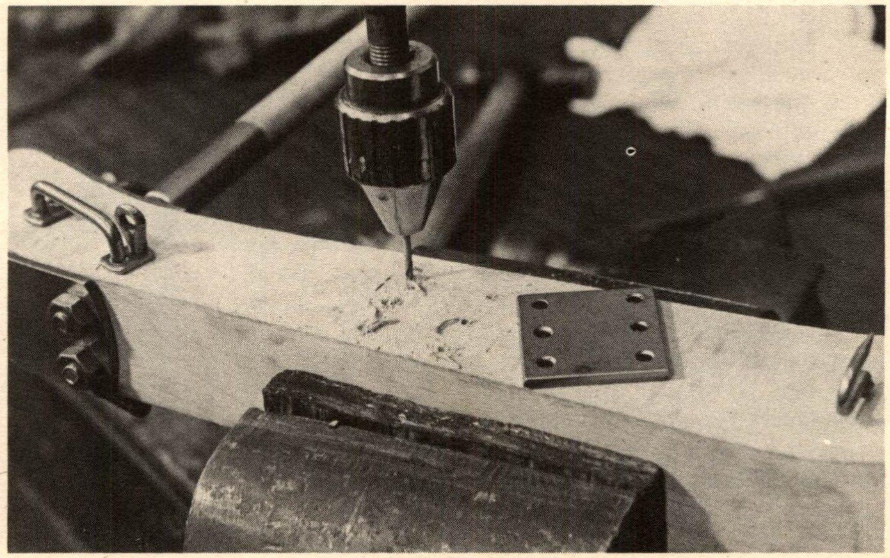
completed cannon and remember the size of the original, the use becomes obvious. When the cannon was moved from one position to another or its direction shifted, it was literally manhandled.

The handspike was unlatched and pivoted up and back to the rear to form a long leverage pole. As this put a lot of stress on its linkage, the handspike pin passed through a hole in the handspike for added strength. The handspike usually was held by two men while two other men picked up the rear of the carriage trail – this is the purpose of the grab irons on each side. These parts simply made moving the cannon by hand easier.

With the towing pintle in place, note the pre-drilled hole in the metal. To fully seat the handspike pin, it is necessary to drill the wood under this hole with a one-quarter-inch drill. The handspike pin is then pressed into the hole, top hook forward. If loose, fill the hole about half full of epoxy, press the cleaned end down flush, wipe away excess glue and allow it to dry.

The handspike assembly consists of three parts: wood rod, metal collar, and screw eye in the end. On this kit the metal collar would not slip over the handspike end. This is as it should be for a snug fit. Bevel the wood end of the handspike to prevent splintering. Next hold a piece of sandpaper in your left hand, place the rod on the sandpaper, and use your fingers to compress the sandpaper around the rod. Now twirl the rod in a 360-degree circle about two times and try the metal collar. Try to sand more toward the wood end. When the metal collar will go on about halfway, just tap it, using a piece of scrap wood, to full depth and snug fit. Next drill a one-quarter-inch hole through the wood using the pre-drilled holes in the metal collar as a guide. If you first use a one-eighth-inch bit, you can make corrections, if necessary, with the one-quarter- inch drill. It is just a step to prevent the one-quarter-inch hole from being out of line. Then turn the handspike screw eye into the wood on the collar end.

Next insert the screw eye into its bracket on the towing pintle, insert the cross pin and secure the small end with a small cotter pin. Your handspike should now swing up, over and back. The hole in the handspike collar should fit over the handspike pin. If it does not, just tighten or loosen the



*Holes are drilled in carriage for installation of wear plate. Attached are such parts as grab rails near towing pintle, trail bucket hook, far right of photo.*

screw eye in the end of the handspike. Now measure ten inches up the tail of the carriage trail, the ruler resting against the rear tip of the towing pintle, and draw a line. Place the leather strap plate on the line and tap two of the brass brads through the plate holes to secure it to the carriage trail. Be sure it is centered. Insert one of the leather straps through the plate ring, lower the handspike and strap in place.

The two grab irons have pre-drilled holes through the side of the carriage trail for the chain ring bolt. Check to be sure the bolt will pass through the hole and that the ring nut fits the threads. Install the two grab irons, chain ring bolt and nut. Examine the large photo to see the angle of the grab irons. Both should be equal on the sides. Mark the position of the rear hole with a pencil on both grab irons. Loosen the nut and swing the grab irons down. Use a 5/64 drill on the pencil mark as a pilot hole for the rear wood screw that secures the grab iron. With hole drilled, swing a grab iron back up in line with the hole and install the screw. Repeat on the other grab iron, then tighten the ring bolt nut.

The two front ramrod brackets have pre-drilled holes in the side of the carriage trail. Pull them up tight as they just screw into the holes. Note their angle in the large photo of the finished cannon.

The two ramrod assemblies are identical, as are the parts that make up the assembly. The large end of the wooden rod is the ram and the small end holds the cleaning brush. Start the construction by installing the wide, metal ramrod sleeve on the forward tip of the ram end. This is a snug fit and will require tapping the sleeve into place with a piece of scrap wood. Next install the smaller, metal ramrod sleeve on the rear of the ram. This also will require a few light taps to fully seat the sleeve. The threaded ramrod tip goes on the opposite end. If it will not start into place, bevel the end of the ramrod tip and lightly sand. It should be a snug drive fit. If the tip or the two sleeves are loose, use epoxy to bond metal to wood. Screw in the brush. Repeat on the other ramrod.

The instructions call for mounting the small trail bucket hook on the right side next, screwing it into its pre-drilled hole. I followed the instructions but found that it was in the way when installing the ramrod pocket and wear plate. If I build another kit, I will install it later as one of the finishing touches.

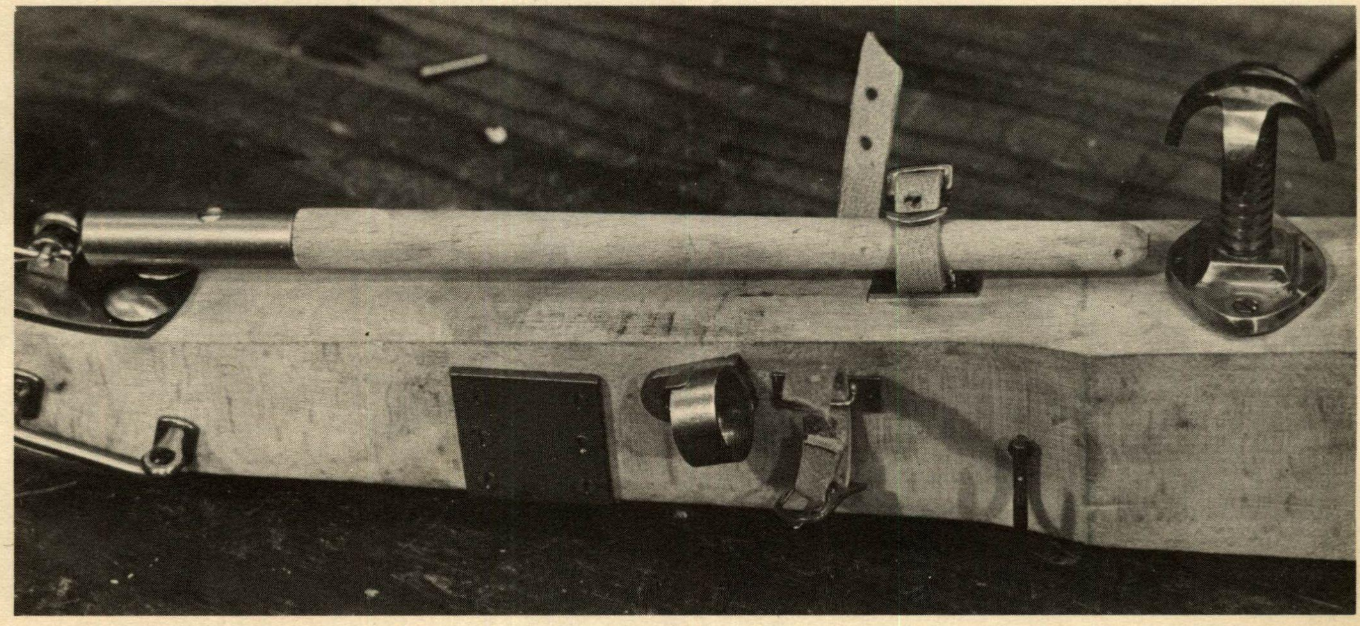
The instruction booklet has an excellent drawing of the ramrod pocket and wear plate. The ramrod pocket is held by a wood screw, installed after drilling a 5/64-inch pilot hole. Be sure the ramrod pocket on the opposite side is equally spaced so that their positions match.

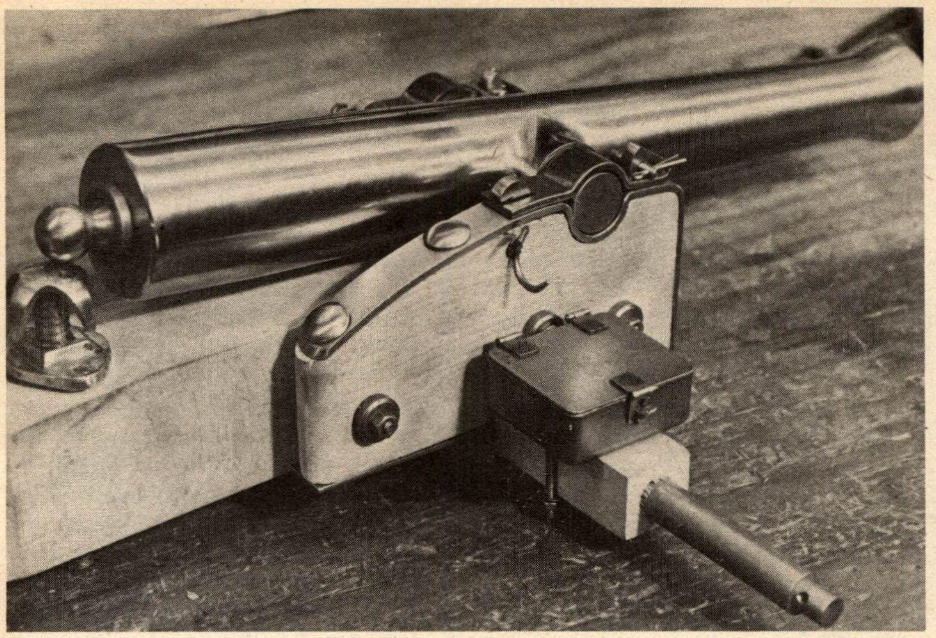
The wear plate, one on each side of the carriage trail, is shown in the drawing in the CVA instruction book. After measuring, be sure the bottom of the plate is flush with the bottom of the carriage trail. Hold the plate in position and use a pencil to mark the six screw-hole locations. Remove the plate and use the 5/64 inch drill for the wood screw pilot holes. Note that the holes in one side of the plate are countersunk to match the heads of the wood screws. With pilot holes drilled, reposition the plate and install the wood screws. Remember to install the screws just a bit less than full depth. This will prevent the screws from starting crooked. Finish by tightening all six screws firmly. Repeat the procedure on the other wear plate.

The ramrods are secured by a small leather strap passing through a strap plate exactly like the one installed for the handspike. To find the location, insert the ramrod in the ramrod pocket and its forward bracket. The little plate, secured by two brass brads, should be directly under the center of the large end of the ramrod next to the ramrod pocket. Install the leather strap through the plate ring and around the ramrod. Repeat the procedure on the other side of the carriage trail.

The small ammunition boxes are excellent. The hinge and even the latch lock works. An ammo box U-bolt passes

*Carriage trail with all components assembled from elevating screw at right, back to towing pintle.*





*Wheels are removed to show details of axle with ammunition can. Top of can opens on functional hinges locking with top catch and latch.*

down through two holes in the box and over the wood axle. A bottom plate goes under the axle and the U-bolt passes through the holes in this plate and a nut on each bolt end pulls the unit up snug. The rear of the ammo boxes should press against the wood side plates with just enough free space to allow the ammo box top to open fully.

Before installation, make a few inspections. The nuts should fit the threaded ends of the U-bolt. I found one too tight, but by working the nut back and forth I smoothed the threads on the bolt end. Next, the U-bolt should pass through the holes in the bottom of the ammo box without scraping the threads. I found it necessary to spring both U-bolts closer together on their ends. This is no problem, as only hand pressure is required. Then check to be sure they pass over the wood axle and through the ammo box U-bolt bottom plate holes. With the inspection and adjustments completed, install one ammo box at a time.

The instruction booklet calls for installing the wheel chock and chain to the grab iron ring bolt next. As the barrel still had to be installed, I performed this task last, as a dangling chain gets in the way at this point. The purpose of the wheel chock is to prevent the wheel from turning and the assembled cannon from rolling out of position when completed. It is a nice authentic touch that adds to the overall appearance of the Napoleon III.

The touch, or vent, hole was drilled on the kit I assembled. If not, there is an indentation on the rear of the barrel that locates the position to drill a one-eighth-inch hole – this matches the fuse sold by CVA to fire the cannon.

The barrel is assembled to the cannon next. With the carriage assembly resting on a bench or table, place the barrel in position with its trunnions resting in the half-moon recesses of the trunnion plates. Adjust the elevation screw down until the muzzle is tipped up to hold the barrel steady. Examine the two trunnion top plates and note that one end is curved. The curved end goes forward toward the muzzle. Lay one on top of each of the barrel trunnions and check to see that the pre-drilled holes match with the similar pre-drilled holes in the lower trunnion plate and the holes in the wood side plates.

Now examine the two bolt clamps that secure the trunnion plates – both have clamps on top, but the front trunnion clamp also has a hole through it for a steel pin which is retained by a cotter pin. Check the nuts on the threaded ends.

Now lift the barrel off the carriage and set it on the bench. The next inspection is to assure that the trunnion clamp shanks will pass through the pre-drilled holes in top and lower trunnion plates, wood side plates, and the bottom plates across the wooden axle. This is just easier to do with the heavy barrel not in position. It also helps you understand what is required in assembling these parts. It is not difficult, just awkward to hold everything in position with the heavy barrel on the carriage.

Everything lined up perfectly on this kit except the hole through one of the bottom plates. Even with parts pressed firmly in place, the clamp's threaded end would not pass. Just a few strokes with a round, tapered-end metal file were required to achieve good clearance.

Before installing the barrel, lay these parts out on the bench in two sets. This makes it easy to pick up the right part when needed. Place the barrel back in position on the carriage. Lay one top trunnion plate in position and install the rear clamp, hook to the rear, and just start the bottom nut to hold the assembly in position. Repeat on the other top trunnion plate. This will assist in holding the barrel in place while you next install the two front trunnion clamps. Just start the nut on each of these as you did with the rear clamps.

Next push up on a front trunnion clamp and insert the steel cross pin. If you need extra room, just lower the muzzle of the barrel. Install a small cotter pin, spreading the ends just enough to keep it from slipping out as you may want to remove it later. Repeat on the other front trunnion clamp.

Everything is now in position. Tighten the four nuts a little at a time on each nut to assure even pressure. Finally,

pull the nuts up tight. It's a good idea to check the tightness of all the nuts on the bottom of the carriage. Each time you installed a bolt you compressed the metal straps and plates and a nut that was tight may now be loose. This final tightening also pulls the plates firmly against the wood and eliminates any gaps between plates and wood.

The inward curve in the wheels goes toward the carriage. Pick up the gun and slip a wheel over the metal axle on each side. Push the wheels inward toward the carriage. Next, install a wheel washer on each side, noting the hole in the end of each metal axle. It may be necessary to tap the end of the axle with a piece of scrap wood so as to space the metal axle equally on both ends, exposing the holes for the large cotter pins.

The kit is now fully assembled. After you have finished admiring your Napoleon III, you will want to fire it. Stop and very thoroughly read the loading and firing instructions until you memorize every step! Do not deviate from these instructions. The cannon is a scaled-down model, but is not a toy. It should be treated with the same respect as a full-sized original.

Your first shots should be blanks, which will provide ample smoke and roar. When you fire the first projectile, be sure you have a range clearance equal to a similar-caliber musket! The barrel should be on zero elevation. It's best to have the projectile kick up dirt than go whistling over tree tops and hit something you cannot see. The next shot should be just a half-turn down on the elevating screw. You will soon learn how much elevation is required for different ranges.

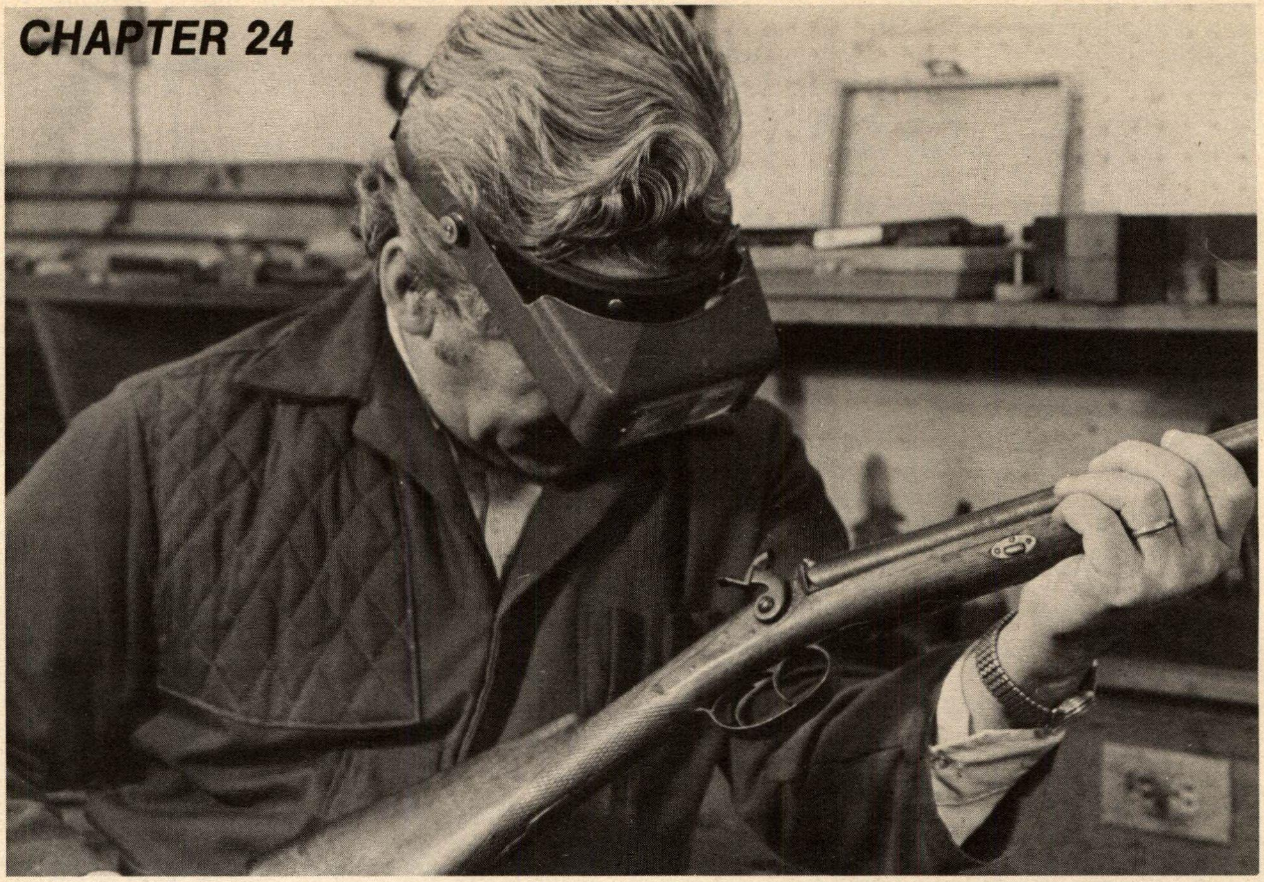
It is a fully functional firearm and a lot of fun to shoot. And, like all firearms, safety is the number one priority.

The kit can be finished in many ways. The steel barrel can be brass plated, blued or left white. The wood can be finished with a coat of any modern gun finish or stained dark oak and then the finish applied.

The original cannon were sometimes brightly painted at the beginning of a war. This looked fine in a dress parade for the home folks, but stood out like a sore thumb on the battlefield. It didn't take many incoming rounds before the cannon were quickly repainted! In the field most had black painted barrels and the carriage and wheels were a dark blue, dull green or dull grey.

The CVA Napoleon III is an attractive cannon and I personally could not paint that nice metal. It remained in the white. The wood was stained dark oak with two coats of Tru-Oil finish. The contrast is excellent and really makes the cannon the center of conversation every time someone sees the little rascal standing tall and impressive by the fireplace.

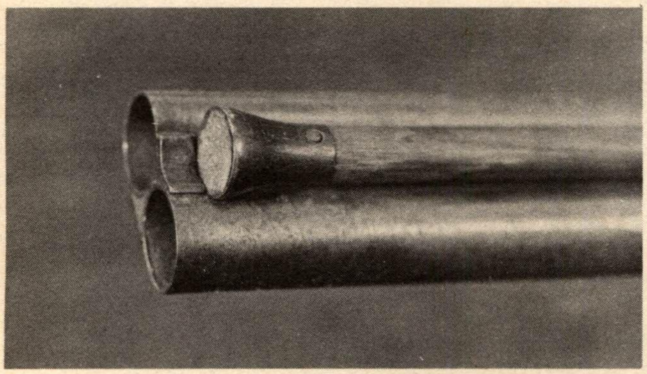
*Connecticut Valley Arms' Napoleon III cannon completed and ready to fire. Walker left the barrel and other metal parts white while finishing wood with two coats of dark oak stain and two coats of Tru-Oil.*




*Before beginning any restoration work, Walker examines each component of the firearm through Opti-Visor magnifier.*

# MUZZLELOADING SHOTGUN AND RIFLE RESTORATION

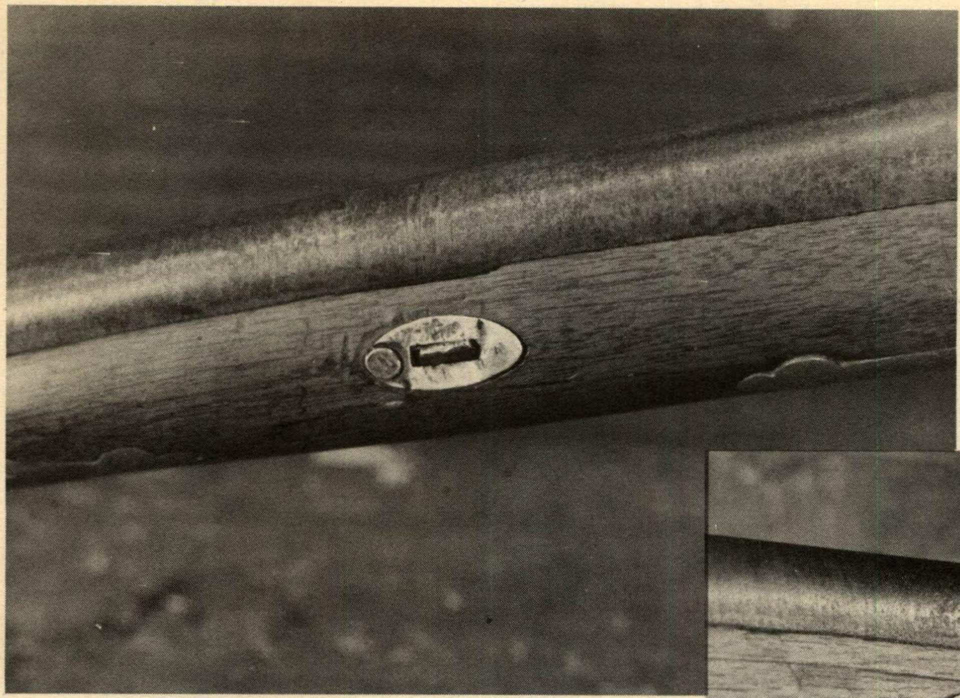
## A Subject On Which There Are No Ifs, Ands Or Buts; If You Can't Do It Right, Leave It Alone!

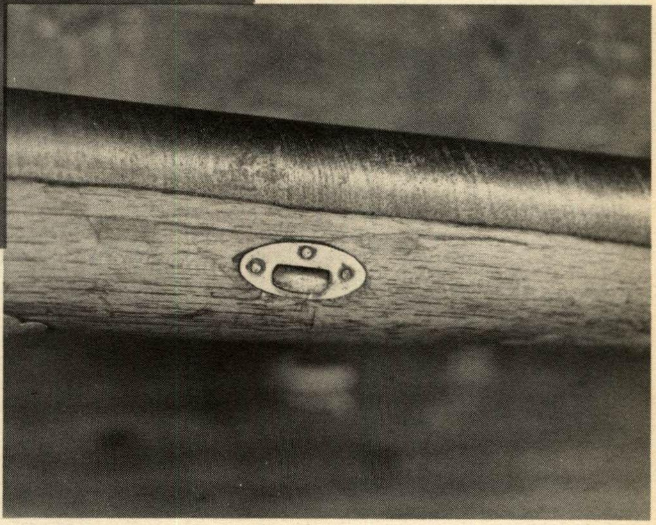


*Muzzle and ramrod button of Ralph Walker's 16-gauge side-by-side muzzleloading shotgun needing restoration work.*

QUITE HONESTLY I have given a lot of thought as to whether this chapter should be included or omitted. My reasons were not that any deep, dark restoration secrets would be revealed. There are none! My main concern is that while some readers will be fully qualified to perform the work, an equal number, if not more, are simply not at this stage in their skill. This is not sitting in judgment of anyone but based on sad, past experience. Too often a beginner acquires an original, rushes in and the end result is best described in one word, disaster.

As an example, a few years ago a customer walked in and said he had an old gun out in the car that he had found hidden in the walls while tearing down an old house. He asked if I would look at the gun and identify it for him.





*Brass wedge plates of shotgun show evidence of incorrect work at some past date. Note large single tack, left, holding plate to forend. Three smaller brads, below, may or may not be correct.*

After he returned and removed the wrapping paper, he laid the rifle on the counter and proudly said that he had worked on a few guns. The gun was a percussion model Sharps rifle with numerous traces of the original blue. This clown then boasted how he had used sandpaper to, in his words, "shine her up a bit." He had rough-sanded the complete gun, metal and all! The wood had been cut down fully an eighth of an inch and then, to top it all, he had wrapped sandpaper around a cleaning rod for the bore!

It was one of the few times I have totally lost control with a customer. I cussed him with every breath and threatened to literally throw him out the front door. All I could think of was the fine old rifle totally destroyed by that idiot.

When you have seen this happen in varying degrees over the years, it makes you reluctant to try to write a chapter on restoration. So I felt that perhaps if I could write it in such a way that people would stop and think before rushing in to "shine her up a bit," then the effort would not add to destruction but perhaps help prevent cases like this.

With the passing of each year, original black powder guns become fewer in number. They are neglected, with rust and deterioration taking their toll. Others are lost in fires and accidents, and still others are damaged so much by inexperienced people that restoration becomes impossible. What was common yesterday becomes scarce today. The question is, what about tomorrow? The only possible hope is that the virtual rebirth of interest in black powder will produce enough people who really care so that these guns are preserved and correctly restored. If finances prevent the new owner from having the gun restored, perhaps the increasing value will result in its sale to someone who will have the work done correctly.

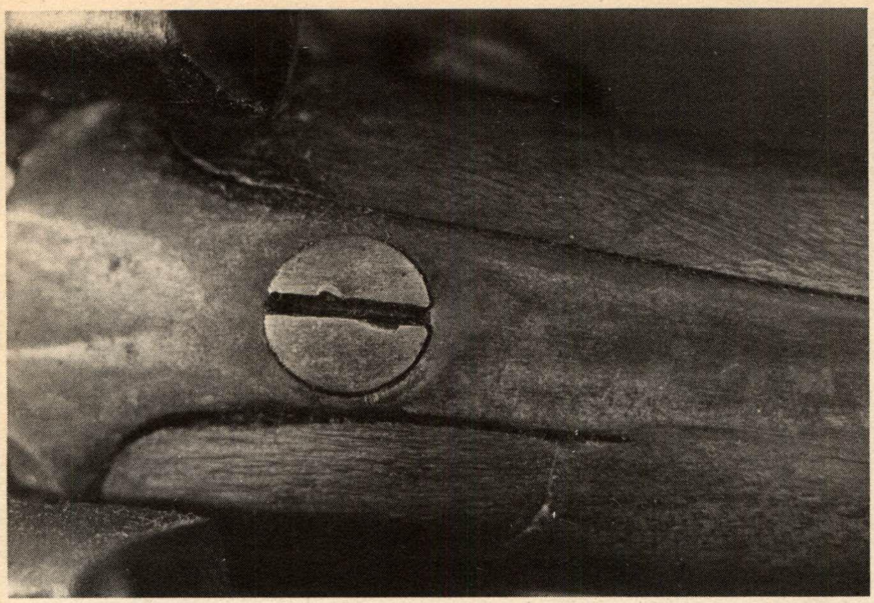
The main danger in gun restoration is the beginner trying to restore a gun beyond his skill level. This usually is an honest mistake, made in an effort to increase the value. What few realize is that such efforts always result in a loss, not a gain, in value. Any knowledgeable collector will verify this, as will a knowledgeable professional gunsmith. The cardinal rule is that the work must be done correctly or leave the gun alone!

Restoration is the top of the hill in gunsmithing, in many ways. Building a modern, full-custom rifle requires extreme skill, experience and technical knowledge. It is, however, a professional gunsmith building a new rifle using his own personal techniques.

An equally competent gunsmith restoring a gun must have all of these qualifications, plus two more. He must be well versed in history and the old gunsmithing techniques. Secondly, before working on another gunsmith's creation, he must study the gun carefully and try to think like the man who built the gun, following his techniques and not those of his own while doing the restoration. Now add patience, for no restoration job can be rushed.

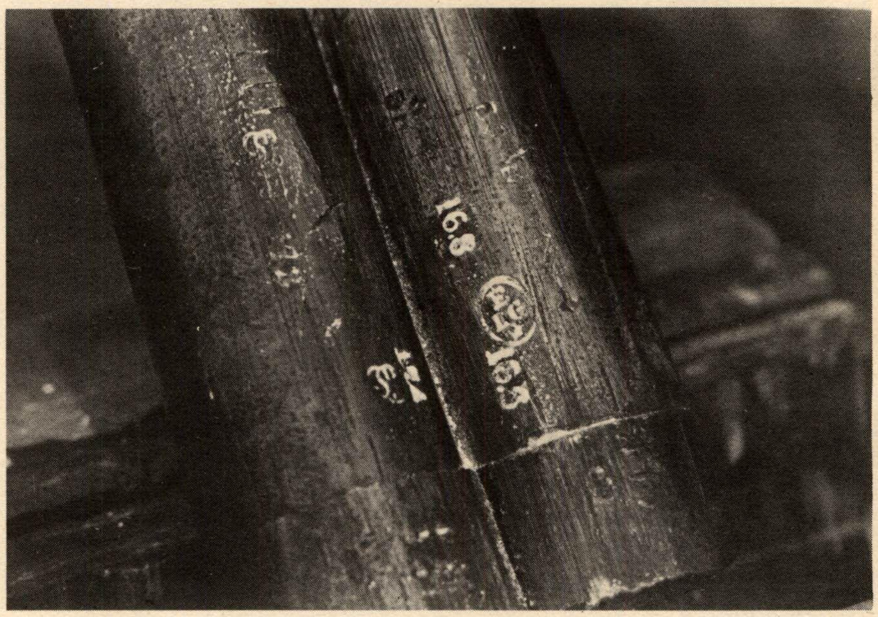
As far as price is concerned, ten years ago a functional percussion rifle could be bought for $100, a shotgun for $50 and a revolver in good condition for $75. Twenty years ago the price was about half that. Today the rifle is $300 minimum and usually twice that amount for one in good condition, while the shotgun is $200 or more and the revolver is $300 or better. These are not rare collector versions, just guns in fair-to-good condition. By the time you read this, the prices will be even higher!

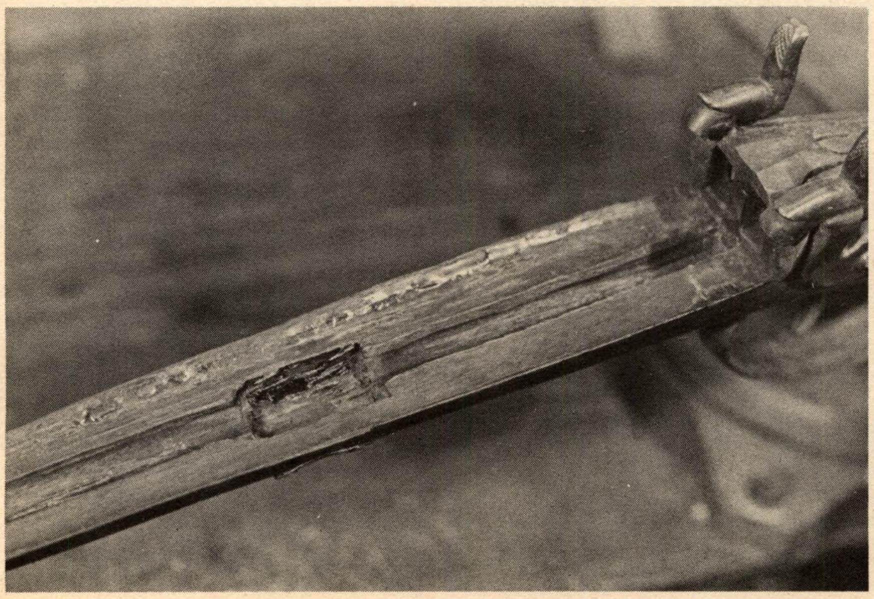
There is a higher and more moral aspect concerning originals. You do not own an original, no matter what the



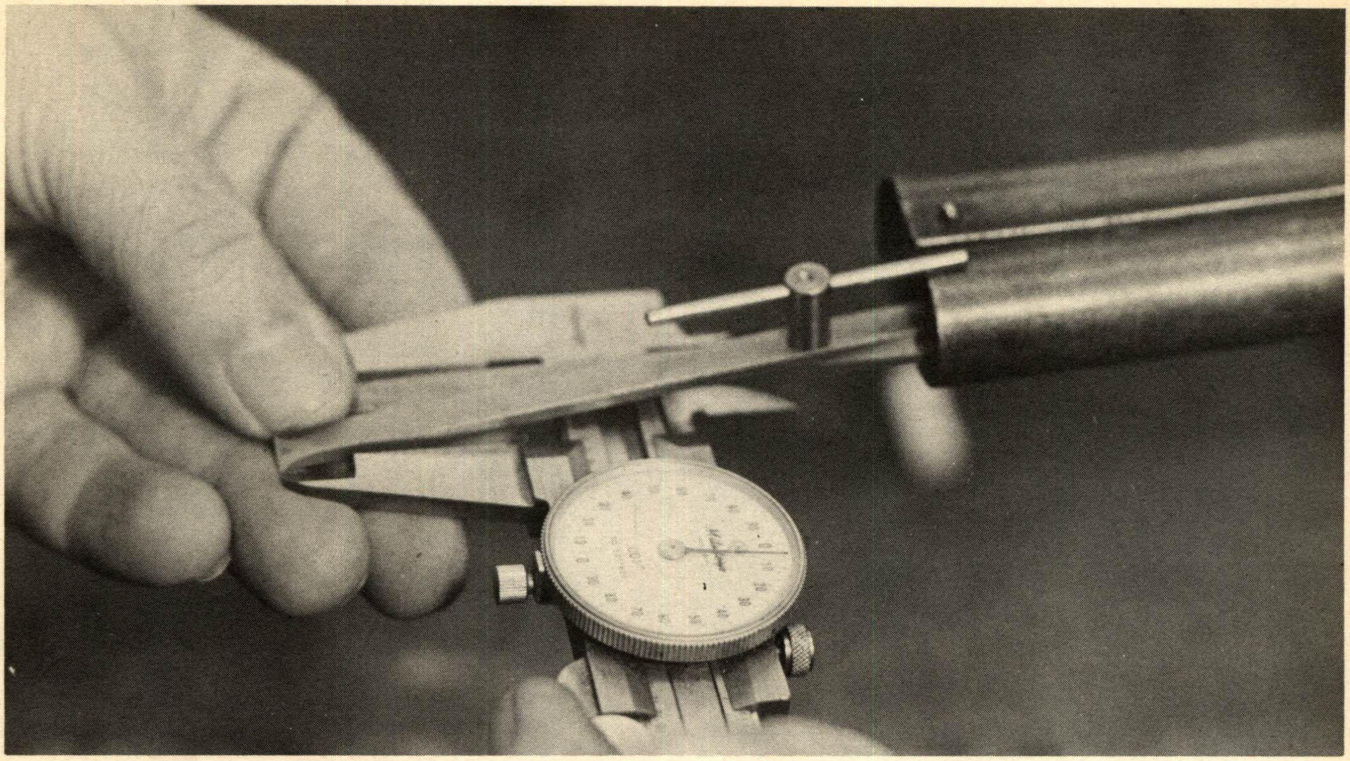
*A burred screw slot, caused by wrong size screwdriver, detracts from appearance of fine antique firearms and must be corrected.*

*Underside of barrels near breech end shows Belgian proof marks. 16.8 stamp designates inside bore diameter in millimeters.*



*Forend with barrels removed shows sloppy repair job of past leaving excess residue of glue.*



*Ralph Walker designed Brownell's Bore Calipers to simplify task of measuring bore diameters. One end is placed inside bore while dial caliper measurement is taken. Without dial caliper, a micrometer may be used in a similar manner.*

value! It existed before you were born in most cases and is only temporarily in your custody. Therefore, it is your moral obligation to take care of it and pass it on at some later date for those who come after you to cherish and enjoy.

The preceding is not a lecture; it is just an explanation of the way every really true antique gun collector feels, which also brings us to the point of what should and should not be done in restoration work.

First, of course, as with any firearm, is to ensure that the gun is not loaded – the procedure has been outlined in a previous chapter. If you cannot be one hundred percent positive that the gun is not loaded, it is prudent to seek the help of a professional gunsmith.

The next step is identification. First, look at the lock plate for any name, dates or proof marks. Some lock plates will have some identification, but many were standard, purchased locks and never stamped; others may have been handmade but not marked.

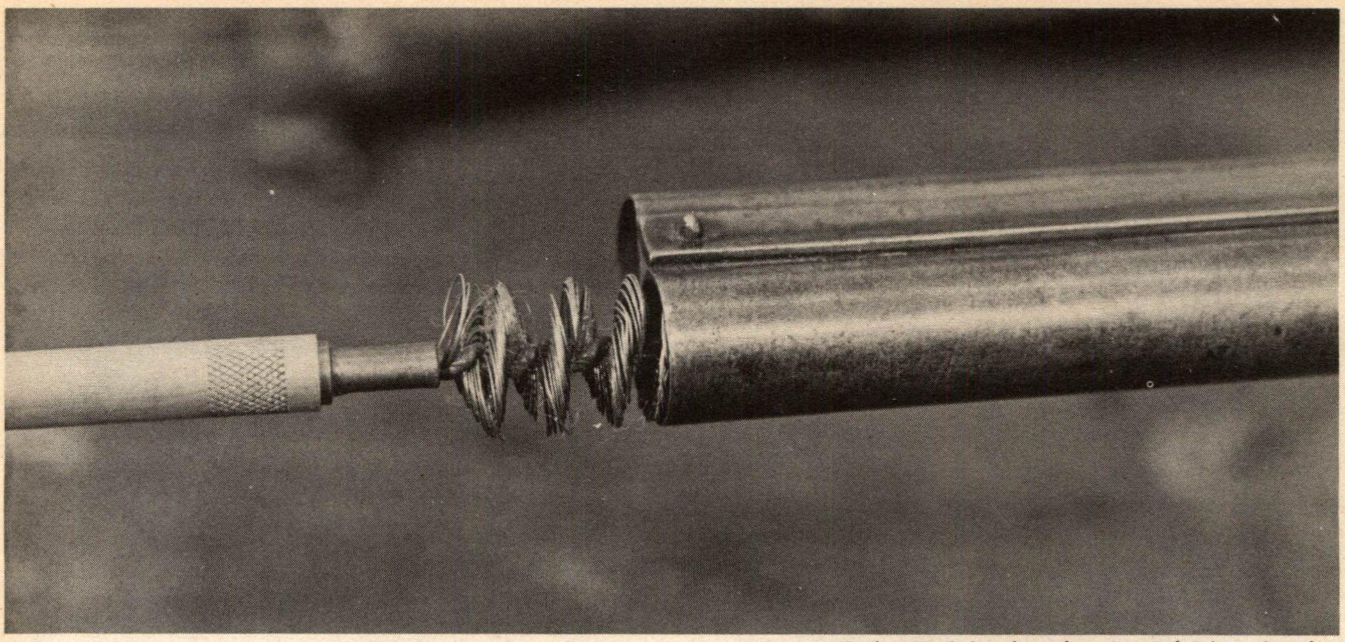
The barrel is the next place to look. Usually the name or some form of identification is stamped on the top near the breech end. Others will be stamped on the sides of the barrel, so be sure to check every surface.

A magnifying glass helps as some markings become blurred over the years. A trick used for photography purposes can be a big help in reading the markings and will not damage the gun if done correctly. Wipe the surface with a clean cloth, then moisten a fingertip and wipe over the markings. Using a piece of common, blackboard-type white chalk, rub lightly back and forth, then up and down over the markings. With a dry fingertip, wipe across the markings. This causes the moisture to go down into the stampings and settle the chalk dust in the markings, temporarily held by the moisture. Using a dry fingertip wipes away the chalk dust on the surface. The chalk dust down in the stamping will make the lettering and markings much clearer. When finished, just use a soft brush to remove the chalk dust in the markings.

All markings and stampings should be recorded on a piece of paper with a rough sketch to show the location of each marking. Quite often there will be markings under the barrels, especially on shotguns, requiring removal of the barrel from the stock, a step that must be done with utmost care. If you do not have the correct tools and skill, have a professional gunsmith remove the barrel.

With all markings recorded, the next step is the taking of measurements. Make a rough sketch of the gun. The first measurement is the overall length of the gun. As most black powder guns have curved butt plates, place a flat board against the butt plate, then measure from the halfway point between toe and heel. Hold the tape straight to the muzzle and record the overall length. Now measure from the center of the butt plate to the trigger. If the gun has two triggers, make two measurements. Then measure from butt plate to the front end of the stock, including any forend tip. Barrel length usually is measured from where the breech plug joins the barrel to the muzzle. You also can make an inside barrel measurement by inserting a cleaning rod to full depth, marking the rod at the muzzle, removing and then measuring the rod from tip to your mark.

With a rifle, shine a strong light into the bore and count the lands and grooves and record them. Insert a dial caliper and measure across the bore, land to land. Repeat measuring groove to groove. A more accurate measurement



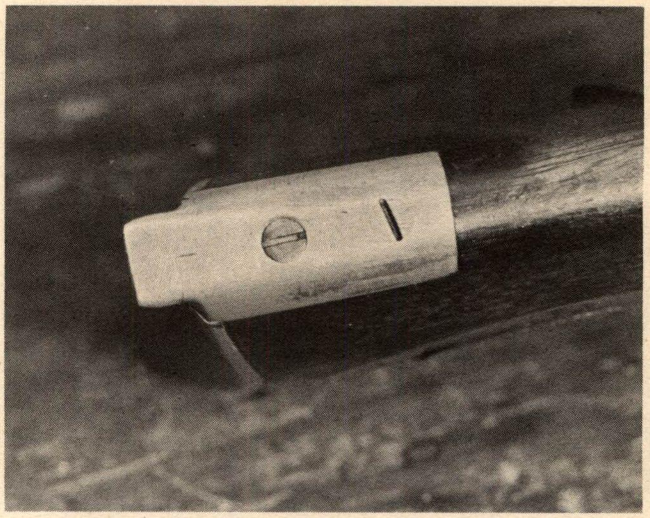
A cleanup job using a heavy cutting bore brush to clean the bores of rust scale and residue will be followed by a light coat of oil and careful storage.

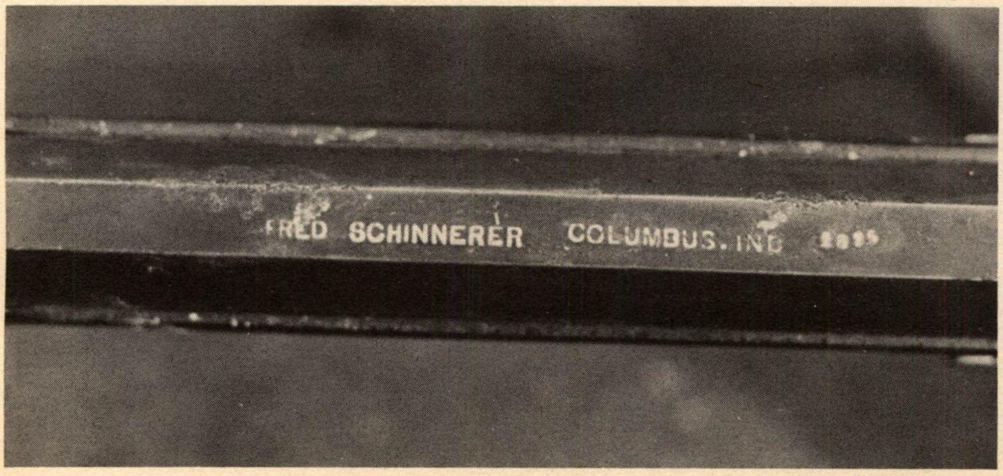
of bore dimensions is obtained by pushing a lead slug through the bore and measuring the slug. This requires removal of the breech plug, definitely not a step for the novice. The measurement at the muzzle will suffice for now.

On shotgun barrels, Brownell's bore calipers will give the best reading, as they reach past the usual slightly worn front muzzle end. You often will find a slight variation between barrels as they were bored independently, then joined. Almost without exception they will be straight cylinder, no choke.

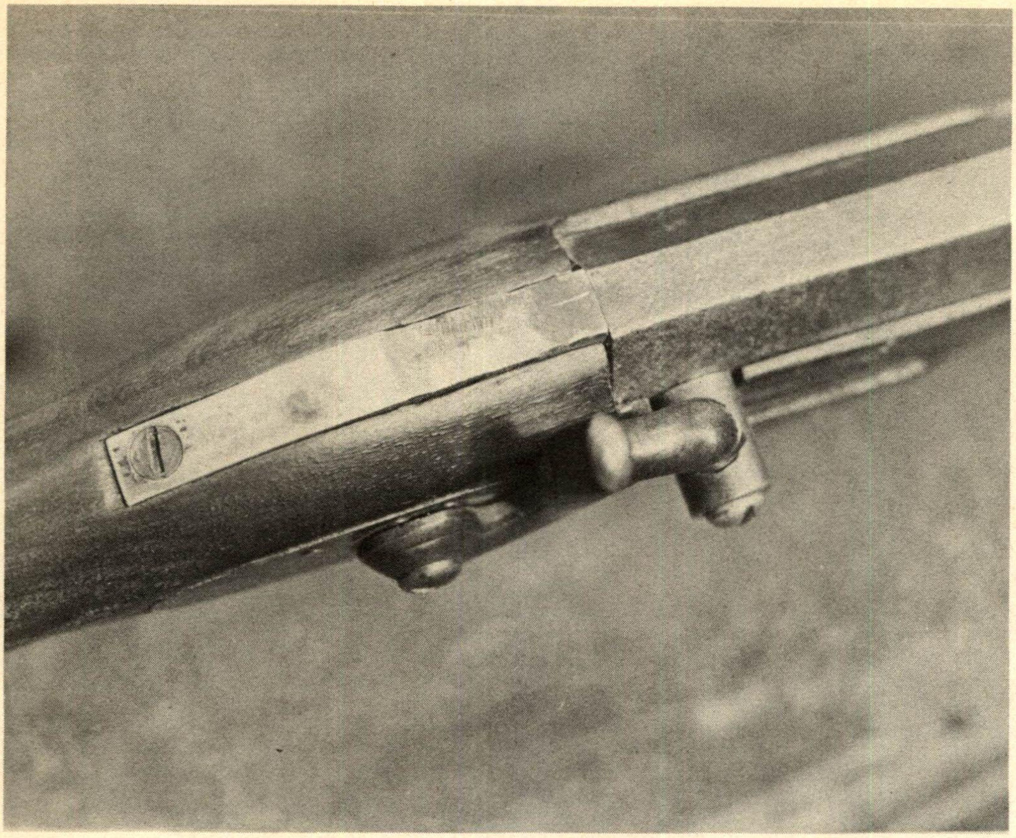
Finally, record with a sketch and notes the material used in the trigger guard, butt plate, ferrules, nose cap and patch box. Every piece of information will be useful in identification. On many well-known guns, a slight variation from accepted standard can move the gun into a higher category in value and rarity.

Now we come to the reason for all of these measurements, notes and sketches: positive identification! This should be determined before any form of restoration is attempted. It requires a lot of research. I have quite an extensive personal library, but on many occasions I've had to turn to outside help. The information recorded, plus

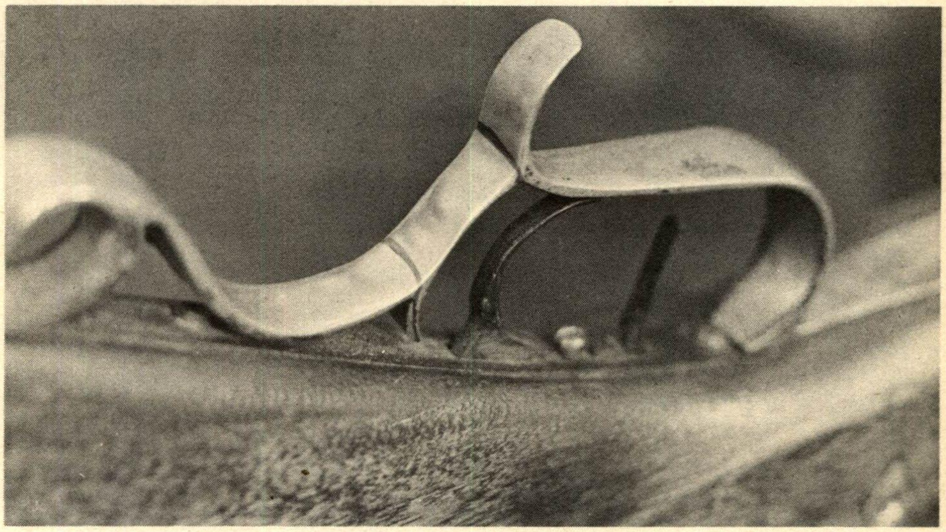





Caliber .285 rifle bears barrel markings shown at left. Date is 1875. Brass butt plate, above, was made from two pieces of heavy brass shaped and soldered. Rear replacement screw of steel stands out against original brass.



*Original, unusual brass extension soldered to steel breech plug tang.*



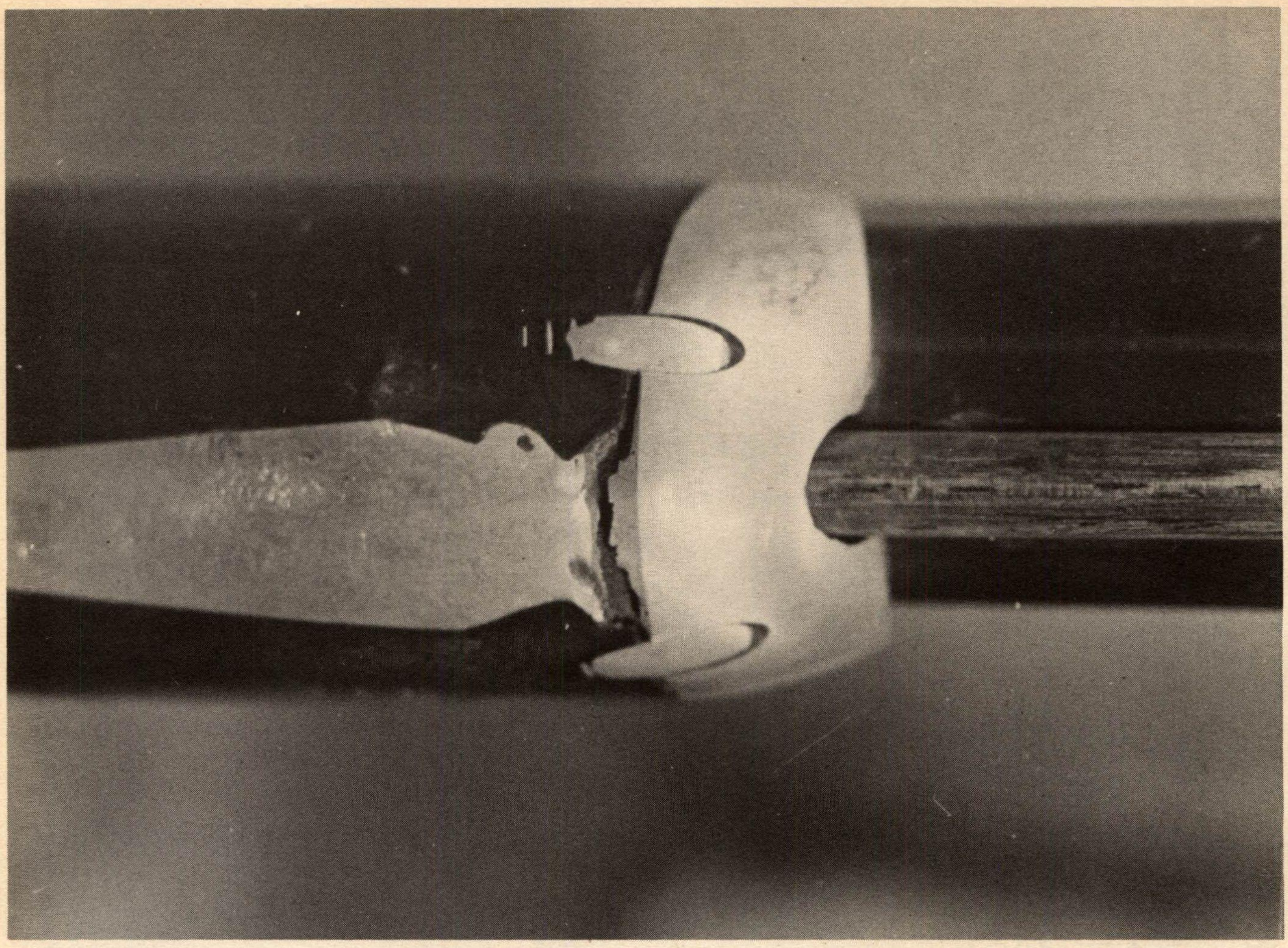
*Heavy brass trigger guard made from three pieces, shaped and soldered together.*

photographs, are essential. The National Rifle Association, National Muzzle Loading Rifle Association, collectors, dealers and gun magazines are sources of information. Always enclose a large, stamped, self-addressed envelope with your data sheet and photos. This assures some form of answer even if they do not have the information – and always offer to pay for the information.

If all this fails, there are several well-qualified antique gun authorities who make their living appraising guns. If you desire only general information and provide a data sheet and photos, the cost is minimal. It is an appraisal of value that is expensive and requires shipping the gun for inspection. The research can be very interesting, and quite often rewarding in value, with self satisfaction a plus. The identification alone is a necessary part of restoration. The more information you obtain, the better qualified you will be to make decisions regarding restoration.

The rifle and shotgun photographs in this chapter are my personal guns and no restoration work has started as I am still gathering information. While they have been closely examined and obvious items requiring restoration noted, the data sheets are not complete; there are, however, some interesting features that make both guns unusual.

The first thing noted about the shotgun is its light weight and short twenty-seven-inch barrels. Close examination of the muzzle under magnification showed no signs of the barrels having been cut. The ramrod stop ledge was in correct position. The ramrod is tapered toward the rear with the usual brass button on one end and a wad puller on the other. Both fittings are cross pinned and

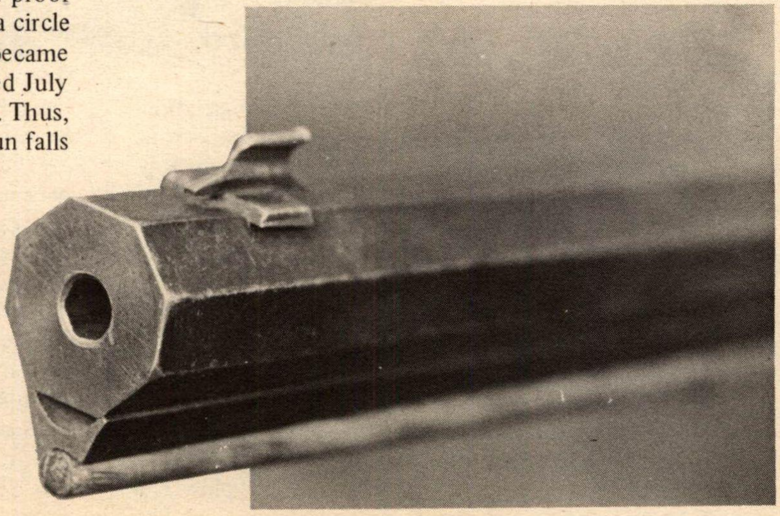


perfectly match the taper, thus ramrod length is correct.

Both back action locks are stamped "Moore & Co." Wm. Moore & Company produced a well-known, high-grade English double. However, the H & D Folsom Arms Company of New York was a marketing firm begun by Henry Folsom in 1859. One of the guns they marketed was a Belgian import using the trade brand name of both "Moore & Co" and "W. Moore & Co.," taking advantage of the English firm's reputation. They used the name until 1884.

Removing the barrel revealed a series of Belgian proof marks. Primary among these were the letters ELG in a circle with a star underneath. This specific proof mark became the final proof mark June 16, 1853, and was changed July 11, 1893 when a crown was added above the letters. Thus, using known dates of proof marks, the age of the gun falls

*Above, unusual brass nose cap is made of four pieces of brass. Cap has worked loose and must be resoldered. Front sight, below, is not seated deep enough to match close-fitting steel rear sight; will be restored.*



in a 40-year bracket. Using the dates of the Folsom Company, the bracket is narrowed to 30 years. As the barrels have a serial number close to 6000, an educated guess would be about halfway of the 30 years, falling approximately around 1870.

The 16.8mm stamping on the barrels converts to .664 inch, which, allowing for wear, closely matched my bore measurement of .670. A 16 gauge was a light gun in that period, further establishing the barrel length as original. See how interesting the research can be?

Holding the gun to my shoulder, the length of pull appears a bit short and the first thing that comes to mind is that it was a lady's gun; but I'm six feet, two hundred pounds in my birthday suit. Ask any doctor and he will tell you that the average male one hundred years ago was around five feet six inches. Measuring the length of pull indicates one-half-inch shy of today's accepted average pull, which is not far off for a correct length of pull for a person around five feet six inches! Interesting, and a bit more history.

To date, the rifle has me stumped on identification. First of all, land to land it is .285 caliber! Groove to groove it is .290, but the rifling is clean and sharp. The barrel has one stamp, "Fred Schinnerer," made with a single stamp, then a second single stamp, "Columbus, Ind." And to this "1875" in individual letter stamps. Next to the breech is "14," again in individual letter stamps.

As the rifle obviously is custom-built, the single-stamp name plus the single-stamp city and state indicate that the gunsmith could afford single line stamps and was probably well established. The slightly uneven single stamp date plus the number 14 adds to the picture. The last name is probably German, but the first name, Fred, indicates American heritage.

The quality of the gunsmith's workmanship is well above average. For example, the trigger guard is not cast. It is made from three pieces of heavy-gauge brass, formed and then soft soldered at the joints. The butt plate also is made from heavy gauge brass in two parts, also soft soldered together. The nose cap is quite unusual, made from four pieces of brass. This man obviously liked brass since the barrel wedge and wedge plates are brass; and every nonessential screw is brass.

Bearing this in mind, the two steel screws clearly are replacements. Barrel length is twenty-eight inches with one inch across the flats width. Judging from his other metal work, the front sight is original brass, but has been set back. The muzzle has been visibly cut, again judging by the other workmanship, but it could not have been shortened more than two inches as the rifle balance would have been way off and very muzzle heavy.

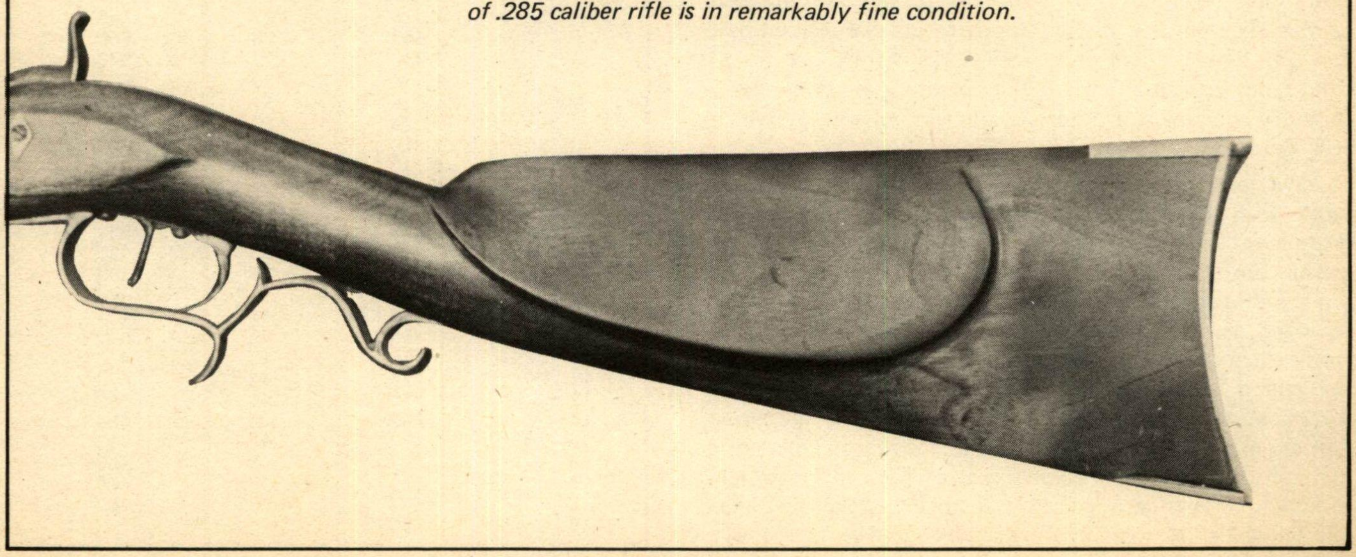
As you will note, even though I have not found any written data on the gunsmith who built the rifle, a lot can be determined by a close examination of the rifle and its components. By studying his techniques and methods, modifications and alterations can be spotted.

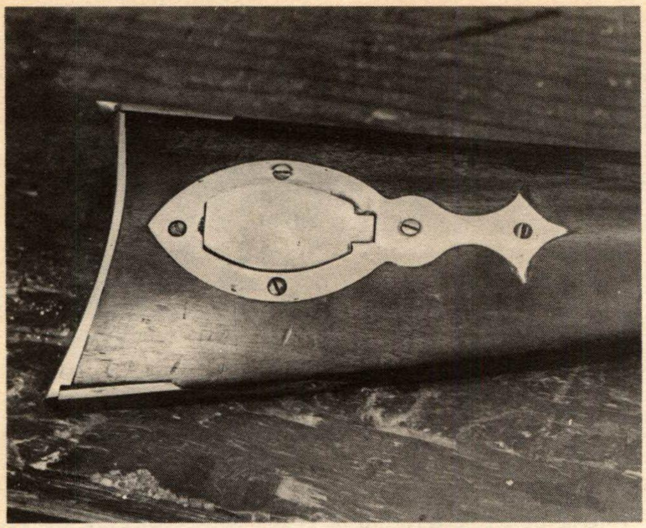
How much restoration has been done? None, as of this date, for I am still gathering data. Only when every scrap of possible information has been gathered will the work begin.

On both guns, visible incorrect prior modifications have been thoroughly noted on each component. For example, on the shotgun both wedge plates are battered and will have to be straightened. One wedge plate has three small brads retaining it to the forend. The other wedge plate has one large head tack retaining it. I will try to find a similar gun, photo or some data that will show how the plates were retained. If this fails, I will, at minimum, restore both to equal appearance.

The two hammer-retaining screws do not match, but from experience I know the left one is incorrect and is a replacement. This will be corrected. The locks are in excellent condition, although the right hammer is slightly loose and will require tightening. The right trigger is tight, the left one is loose and will require tightening. All screws have their slots burred from use of incorrect screwdrivers and will require careful restoration. These are just a few specific items, but they illustrate how each part and

*Despite more than a century of wear, wood stock of .285 caliber rifle is in remarkably fine condition.*





*Butt plate is constructed of two pieces while brass patch box is nicely inletted. Screws may need restoring.*

component must be studied, researched and only then can restoration begin.

The rifle's items are obvious, such as replacement screws of steel rather than brass. One of the solder joints on the nose cap will have to be resoldered as it is loose. The lock will require only minor restoration. The barrel muzzle appears to have been cut, but correctly recrowned to match this type rifle and time period. The rear sight is extremely tight and clearly is the original installation. To match this, the front sight will have to be seated deeper. Again, these are illustrations of how each part, no matter how small, must be restored correctly.

During the time you are doing the research, the exterior must be retained as original as possible. As research takes time, the gun should be protected and any further deterioration halted. Even this step must be done correctly!

Again, the first item is to check for a loaded gun, the next to remove dust and accumulated crud. A clean, soft cloth wiped lightly over the gun several times will remove most of it. Use pipe cleaners, cotton swabs and similar dry items to get into close places. Screw slots can be cleaned by using dry toothpicks to remove dirt and accumulated residue. The purpose of this step is to remove residue that can trap moisture and thus increase rusting. Do not try to "shine her up," just remove the outside loose grime using only dry equipment. Do not use any form of solvent, which will sometimes remove natural aging on the finish.

Now, put a few drops of good gun oil on a clean, soft cloth. Rub the cloth together to spread the drops of oil. Wipe every iron or steel part, putting an ultra-thin oil coating on the surface. Do not soak the part in oil, just apply a thin coat. Do not apply oil or anything else on brass or wood; leave it dry. One of the most common mistakes made when someone finds an original gun is to heavily coat everything with oil. They respect the gun but make an honest mistake trying to halt deterioration. Oil and wood just do not mix – they make the restoration job more difficult. Some apply wax or a coat of Linseed oil, which, although better than regular oil, is still a mistake. Just wipe the wood lightly with a soft, dry cloth and leave it alone. Aged brass can be equally damaged so follow the same rule as with wood.

As previously described, rifle barrels can be measured at the muzzle across the lands and across the grooves. The muzzle end may be slightly worn but you can determine caliber close enough for your research. Muzzleloading shotguns present more of a problem. Most people do not know measurement in hundredths of an inch can be used to determine gauge. The term gauge originated in the size of the shotgun bore measured by passing a pure lead round ball through it – if twelve of these balls were required to weigh a pound it was a 12 gauge; sixteen balls to a pound, 16 gauge and so forth. The British Proof Act of 1868 follows this fairly close.

The current SAAMI specifications were set for American manufacturers. They are 12 gauge .729, 16 gauge .667, 20 gauge .617 and 28 gauge .550-inch. The only problem is that no one follows the specifications! With American and imported shotguns, 12 gauge ranges from .716 to .746, 16 gauge from .656 to .686 and 20 gauge from .606 to .632-inch. Those stamped in metric can be converted to inch by multiplying the metric number by .03937 or, if you want to round it off to a reasonably close measurement, multiply by .04 factor. Remember that the shotgun will have some slight bore wear near the muzzle.

You will often find shotgun muzzles appearing to be worn off on one side. This may or may not be correct. A crude but effective old way of correcting point of pattern impact was by filing one side of the barrel. A worn barrel will be extremely thin on the entire muzzle edge.

While modern reproductions follow fairly close caliber dimensions, this is seldom true on handmade original rifles.

*Table below is the full listing of English shotgun bore sizes as given in the Gun Barrel Proof Act of 1868.*

| Gauge No. | Bore Diameter | Gauge No. | Bore Diameter |
|---|---|---|---|
| A | 2.000" | 20 | .615" |
| B | 1.938" | 21 | .605" |
| C | 1.875" | 22 | .596" |
| D | 1.813" | 23 | .587" |
| E | 1.750" | 24 | .579" |
| F | 1.688" | 25 | .571" |
| 1 (one) | 1.669" | 26 | .563" |
| H | 1.625" | 27 | .556" |
| J | 1.563" | 28 | .550" |
| K | 1.500" | 29 | .543" |
| L | 1.438" | 30 | .537" |
| M | 1.375" | 31 | .531" |
| 2 | 1.325" | 32 | .526" |
| O | 1.313" | 33 | .520" |
| P | 1.250" | 34 | .515" |
| 3 | 1.157" | 35 | .510" |
| 4 | 1.052" | 36 | .506" |
| 5 | .976" | 37 | .501" |
| 6 | .919" | 38 | .497" |
| 7 | .873" | 39 | .492" |
| 8 | .835" | 40 | .488" |
| 9 | .803" | 41 | .484" |
| 10 | .775" | 42 | .480" |
| 11 | .751" | 43 | .476" |
| 12 | .729" | 44 | .473" |
| 13 | .710" | 45 | .469" |
| 14 | .693" | 46 | .466" |
| 15 | .677" | 47 | .463" |
| 16 | .662" | 48 | .459" |
| 17 | .649" | 49 | .456" |
| 18 | .637" | 50 | .453" |
| 19 | .626" | | |

Usually the bore was reamed as close as possible, then the rifling was cut. When finished, a lead slug was pushed through the bore and then a bullet mold made to match that barrel. As the rifling became worn from use it was freshed out. In effect, the barrel was rebored and rerifled to the next largest caliber. Occasionally the grooves were cut deeper and a thicker patch used.

After your research has been completed and all data gathered, it is time for restoration. How much and what you restore should depend on your demonstrated skill. It is not a time to experiment!

If you are not one hundred percent sure you are qualified to do the required job, leave the gun alone! If all I could do was correctly restore screws, I would be proud of just that accomplishment. If this sounds silly, let's take just the head of the screw, ignoring the threads. How do you correct a burred screw slot?

First you must clean the slot of all residue. Then you have to decide if the slot can be widened by careful filing, but another possibility exists. You can use a punch with a smooth face to lightly peen the metal beside the slot, extruding metal inward toward the slot. This is not as easy as it sounds. You have to hold the punch lightly between the fingertips and lightly tap the rear of the punch quickly with the hammer. The punch slips between your fingers, strikes the surface of the screw, then bounces. It may require a dozen strokes on just one half the width on one side of the slot. Sometimes you have to combine peening and filing to correct the screw slot. The finish has been changed either way. Now comes the problem of artificially aging the surface to match the surrounding metal, which opens a whole new ball game since there is no standard method – there are about a dozen, and you have to choose the right method for that particular gun.

How about just replacing a brass wood screw? Well, Simple Sam trots down to the local hardware store and buys a box of screws. Back at the shop he discovers that most modern brass screws are really brass-plated steel screws! When he alters the head he cuts past the brass coating and there is the steel!

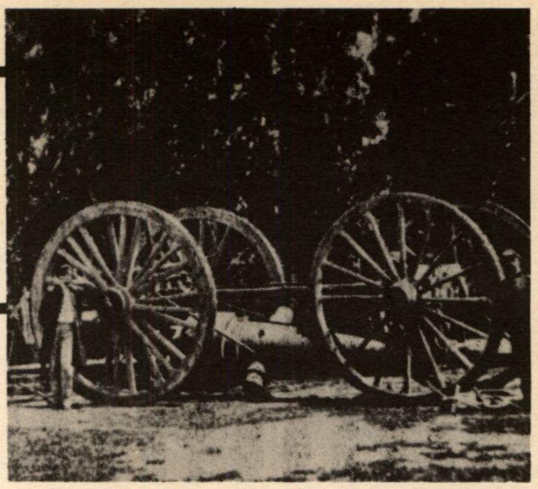
Next, old Sam says he can stop this mess by trying a magnet on the screw. So he buys a box of one hundred percent, genuine brass screws and trots back to the shop. Now he discovers that it fits but does not look right. Why? The color of brass depends on its composition as it is an alloy. Usually you can locate the correct one by taking along an original brass screw; but be careful, most have a coat of finish on the screw. On some occasions I've had to machine a wood screw from brass stock, then file the threads on the shank.

So you see, correctly restoring a simple screw becomes far more involved than the average person realizes. If a screw can be this much of a problem, it's not difficult to imagine what's involved in restoring a complete gun! As I have stated before, no one person is one hundred percent qualified to restore every antique firearm. There is no dishonor in admitting you are not qualified for some types of restoration – it's just the opposite. People who know firearms respect such a person. Remember, restoration must be done correctly, or not at all.

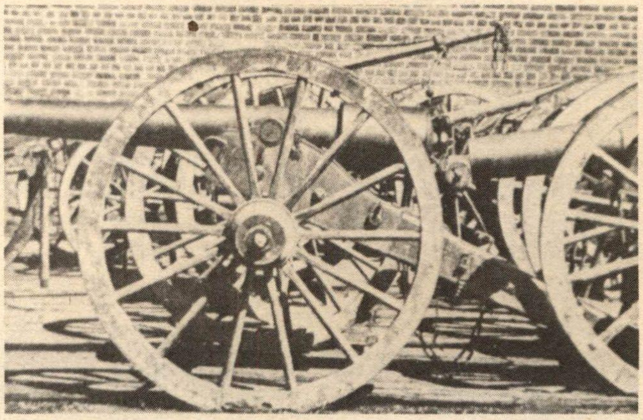
*Walker checks the balance and sighting system of antique .285 rifle described in text. Research continues before restoration.*

## CHAPTER 25

# THE BROOKE THAT ROARED



Above: Civil War photo shows the size of wheels as compared to soldier standing near axle. Sling wagon was used to move Brooke cannon. Below, light field artillery gun had single band of wrought iron around chamber area of Brooke.



### Stories That Could Be Told By Those Ancient Cannon That Have Stood Mute On Court House Lawns For Over A Century

THROUGHOUT HALF OF the country in parks, battlefields, historic forts and on courthouse lawns, muzzleloading cannon stand guard against the ghostly foe of yesteryear. They speak of Fort Sumter, Shiloh, Vicksburg, Bull Run and a hundred other battles of the war to establish the Southern Confederacy, or if you are of northern sympathies, the Civil War. The average American takes a quick look and then hurries along to the hot dog stand.

Only the student of that great war will stop to examine the craftsmanship that went into their building and wonder what stories they could tell. In his mind's eye he sees the muzzles belching fire and canister shot at charging ranks of blue or gray. Perhaps he sees a solid shot – the traditional cannonball – as it screams across sandy beaches to send geysers of water washing over the decks of an enemy ship.

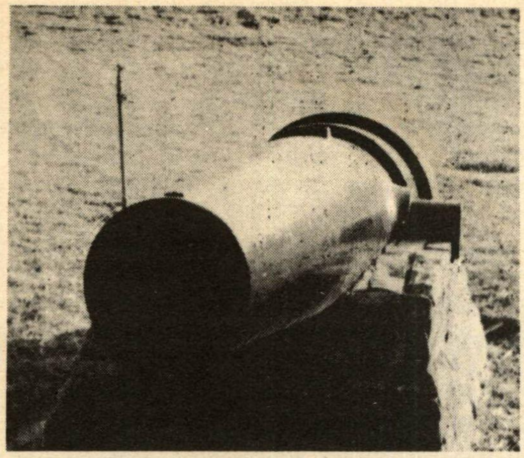
The identity and history of the displayed cannon have, for the most part, been lost to posterity. Only a few will be documented to actual use in a specific engagement or as part of a certain battery. By pure accident, I stumbled onto several fascinating documents that revealed not only the history of a well-known cannon on public display, but the step-by-step factory record of its manufacture, as well.

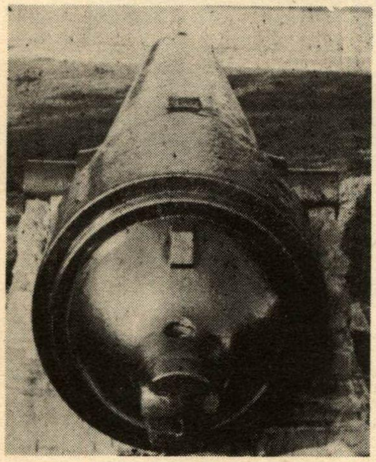
The Confederate Brooke cannon is well known to the student of this period, for it was credited by both North and South as being the best developed during the war. The guns were almost twice the size of similar caliber guns, and are considered to be the most powerful muzzleloading, rifled cannon ever made. Their strength was derived from an enormous charge of black powder that would have burst a regular cannon of comparable caliber. The pressure was contained by the semi-steel construction of the heavy casting and the two thick, wrought iron bands that surrounded and strengthened the chamber area. Brooke projectiles weighed from seventy pounds in the 6.4-inch bore up to 230 pounds in the eleven-inch rifled cannon. Range was up to 2200 yards, which is quite impressive when compared to similar guns of that period.

The Brooke system of rifling is of the ratchet or sawtooth type. A cross section of the land appears as an inclined plane or a triangle lying on its side, instead of the usual square or rectangular-shaped land. Its purpose was to ease the cleaning of the grooves and to prevent their becoming clogged with powder residue during intensive firing. Another purpose was that the twist of the rifling kept the shell's brass sabot pressed tightly against the vertical face of the land.

The Brooke shell had a forward band as part of its main body that was of the same diameter as the land diameter to provide support for the front of the shell. The brass sabot was of the same diameter and was attached to the rear of the shell with a square-headed bolt. The shell slid down the bore easily from the muzzle, allowing fast reloading. On firing, the pressure from the gas expanded the rear of the cupped, soft brass sabot, upsetting it enough for the flange to engage the rifling and impart rotation of the shell.

At the time of the secession of the Southern states, John M. Brooke resigned from the U.S. Navy and promptly accepted a commission in the Confederate States Navy with the rank of captain. Because of his vast experience in Naval ordnance, he was made head of the Southern Ordnance and Hydrographic Bureau. Catesby ap.R. Jones, also a former U.S. Navy ordnance officer, soon joined Brooke in the design, construction and arming of the ironclad, Virginia. This was the old U.S. Navy ship, Merrimac, that had been partially burned and sunk by U.S. forces when they abandoned the Norfolk Navy Yards to the advancing Confederates. The Merrimac was raised by the Confederates, rebuilt into an ironclad and recommissioned





*S-89 Brooke, above, has a seven-inch rifled bore and is located at Ft. Morgan, Alabama. Gun at left was built in Selma, Alabama, armory.*

the Virginia. Oddly enough, Jones had once served aboard the old Merrimac as executive officer prior to the war.

The Virginia (Merrimac) was completed and, at Hampton Roads, Virginia, on Sunday, March 9, 1862, engaged in the historic first battle of ironclad ships commonly known as the "Battle of the Monitor and the Merrimac." The captain of the Virginia was wounded during an engagement the day before the historic battle and Jones, who was serving aboard as executive officer, actually commanded the Virginia during the battle. The Virginia was heavily armed with Brooke guns in addition to other armament.

Because of his gallant service during the engagement, Jones was promoted to the rank of commander. In addition to such service as supervising ship armament and land fortifications, Jones continued working with Brooke in perfecting the design of the Brooke gun and in increasing production at the Tredegar Foundry and Iron Works at Richmond, Virginia. Brooke guns of every weight and use, including field artillery pieces, were made at Tredegar, but the need for more and more guns forced the Confederacy to look for other sources.

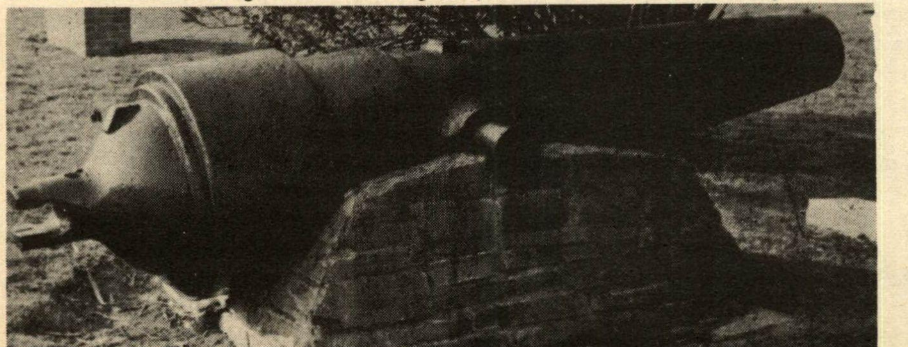
Selma, Alabama, is located approximately in the center of the state and at first glance would appear to be the least likely choice for a cannon foundry and Navy yard. However, on second glance, some noteworthy assets started to appear. It is far enough inland so that it provided protection against Federal raiding parties. It is located on the bank of the navigable Alabama River whose waters empty into Mobile Bay on the Gulf Coast. In addition, coal fields, iron ore beds and limestone deposits were within easy reach. And – of extreme importance – it was at the junction of the Alabama and Tennessee railroads. The decision was made.

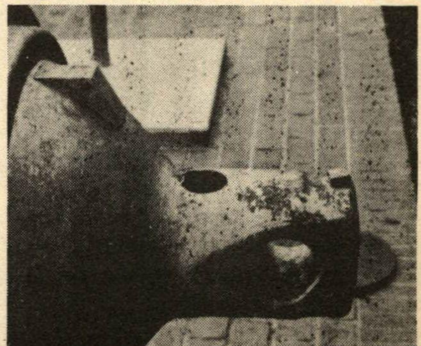
In late 1861 Colin McRae had started a foundry at Selma and, with added facilities, Selma already was contributing heavily to the Confederacy's war needs. In early 1863 the Confederate Navy assumed control of the Selma Ordnance Works and placed Commander Catesby ap.R. Jones at its head. His orders were to build cannon on the Brooke pattern in addition to other war materiel which included iron-clad vessels. The most famous iron-clad built at Selma under Jones' direction was the Tennessee, which played an important role in the Battle of Mobile Bay.

Brooke gun manufacture at the Selma Cannon Foundry began July 30, 1863, under the command of Jones with the able assistance of George Peacock, a well-known English ironmaster. A total of seventy-three Brooke guns were completed and shipped from Selma. Seven more were completed but condemned. A few more were manufactured but not shipped, for reasons unknown to the author. Of the seventy-three shipped, fifteen were of the 6.4-inch rifled version, thirty-nine were rifled seven-inch models, and one was an eleven-inch rifled gun. In the smoothbore version shipped, five were in eight inch, seven in ten inch, and six in the big eleven-inch bore. This is an amazing record considering that so little machinery was available and most of the manufacturing equipment was handmade on the spot.

The Selma-manufactured Brooke guns are serial numbered on the trunnion with the letter S as a prefix. The year of completion and the weight of the gun is stamped in

*The Brooke gun below was discovered in recent years and was restored atop native stone mount. Rear of the big cannon is massive enough to withstand great pressures and is considerably different in design from other guns.*





several places on the gun. The right trunnion is stamped "C.ap.R.J." the initials of Commander Catesby ap.R. Jones and the final acceptance proofmark.

Selma Brooke guns saw service throughout the Confederacy, aboard ships and as part of land fortifications. They were used as far north as Wilmington, North Carolina, which is impressive when you consider the enormous weight and limited transportation available. They were on board the Confederate ships Tennessee, Gaines, Selma and Morgan during the Battle of Mobile Bay. Land fortifications surrounding Mobile, such as Fort Morgan, Fort Hughes, Fort Powell, and Spanish Fort, also mounted Brooke guns, especially the seven-inch rifled version. This is the battle, by the way, during which Admiral Farragut uttered his famous "Damn the torpedoes – full speed ahead!" One cannot help but wonder if it was the torpedoes or the seven-inch Brooke guns, as it is a recorded fact that the latter played havoc with his flag ship, Hartford, during the engagement.

One of these guns, a seven-inch rifled Brooke with serial number S-89, currently is mounted at the entrance to old Fort Morgan, which is located on the east side of Mobile Bay. No visitor to Fort Morgan can help but be impressed by the sheer bulk of this gun. Thousands have seen it but few know the story of its birth.

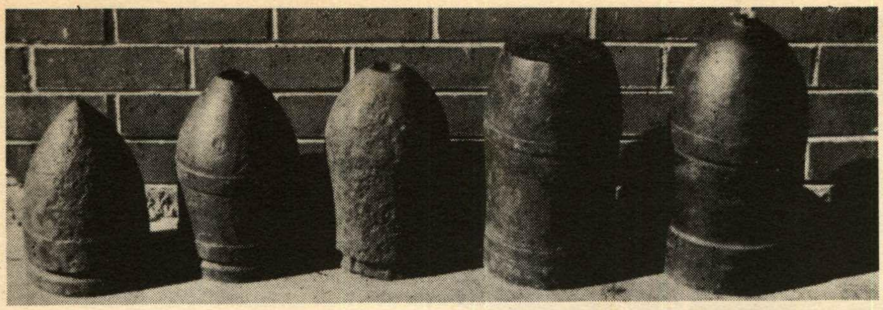
The accompanying fascinating manufacturing record of Brooke gun number S-89 is taken from the ledger of the Selma Cannon Foundry, Confederate States of America, pages 186, 187 and 189. The words are those of the recorder, and the only liberty the author has taken is to omit the long and extensive metallurgical testing that space does not permit.

From start to finish, production consumed a total of five months and twelve days. Naturally, more than one cannon was in process, but the arsenal worked twenty-four hours per day and six days per week. The total recorded machining time was 1077 hours, which does not include the

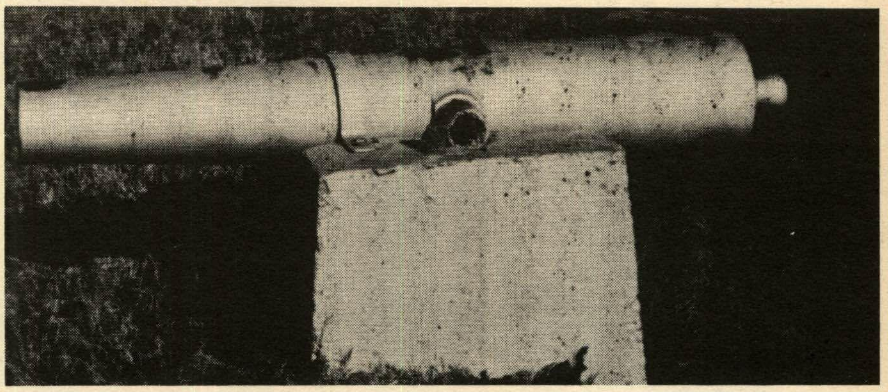
**GUN No. 89 7 INCH**
**SELMA CANNON FOUNDRY, ALABAMA**

Date: Monday, July 25, 1864
Wind: East
Weather: Clear
Mould made of strong loam and small portions of sharp sand
Moulders: J.M. Blankenship & Assistants
Flasks used in 7 sections
Melting of furnace No. 3 63 times
Mould in oven 24 hours
Bibb cold blast pig iron No. 1 18,000 pounds
Mode of charging furnace. Iron in four piles. In the first pile below the tap hole 3 layers of low order No. 1. In the second pile next to the tap hole, 3 layers of No. 1 & 7,000 pounds of low order No. 1 on it. In third pile, 5 layers of No. 1 and the balance of low order No. 1 on it. In fourth pile the balance of No. 1 iron laid cross ways.
Wood sawed about 18 inches in length. Kind pine, character good, resinous.
Oven lighted 8 A.M. Fireman, M. Flinn
Metal commenced to fuse at 9:05 A.M. Total fusion at 3:15 P.M.
Furnace tapped at 5:11½ P.M. Commenced running from reservoir 5:12 P.M. Time in total fusion 1 hour, 56½ minutes.
Time in running into mould 4½ minutes.
Appearance of metal, color white, fluid, sparkling slightly. Slag only a small amount.
To retard cooling. Charcoal put on top of gunhead 10 minutes after gun was cast and iron cover put over it on top of pit which was covered with earth and sand also the plate on which the cover rested.
Cover taken off August 1st. Hoisted out August 2nd. Time in pit 8 days.
Temperature when taken out too hot to press hand against it. No therminal imperfections.
Head cut off August 17th.
Placed in boring mill August 18th.
Muzzle faced August 19th. Commenced to bore gun August 19th 9½ P.M.
Note Sept. 6th, 2 P.M. Tool taken out and antlers found quite soft & had to be hardened. This is cause of boring so slow. (Author's note: the "antlers" referred to in the ledger note is the cutting bit of the boring bar.)
Fourth and final core out Sept. 27th 8 A.M.

Commenced boring with piercer Sept. 29th 3 P.M. Finished Oct. 2nd 5 A.M.
Commenced boring with reamer October 4th 8 A.M. Boring completed Oct. 8th 3 P.M.
Total time boring 895½ hours.
Measurement of bore and chamber with rod – 121.11 inches
Rifling commenced October 17th 5 P.M. and finished October 19th 9 P.M.
Total time rifling 13 hours.
Turning commenced October 20 8 A.M. Finished October 22nd 10 A.M.
Trunnions finished Oct. 27th 8 A.M.
Bands. Inner band put on October 31st. Finishing turning November 7th 11 A.M.
Outer band put on November 10th. Time turning bands 51½ hours.
(Author's note: The outside of the cannon was turned, then the inside of the first band was turned slightly small. The band was then heated red hot which expanded it and allowed it to be slipped over the larger but cooler cannon diameter. When the band cooled, it shrunk to a skin-tight fit on the cannon. The outside of the first band was then turned and the process repeated with the second band.)
Sighting finished November 17th. Elevating screw finished November 18th.
Cascabel block finished November 22. Breeched November 21st. Vent bored November 23rd.
Inspected and proved November 29th.
Distance between sight box and sight line 2.38 inches.
Weight 14,800 pounds. Prep. at Base Line 904 lbs. On screw 735 lbs.
Turned over to Qr.M. for shipment to Flag Officer E. Farrand, CSN, Mobile, Alabama, January 6th, 1865.



*The five 7-inch Brooke shells at left were collected by William Lyles with a metal detector. All are defused.*



*Light Brooke that was never finished does not yet have wrought iron bands at rear. Gun was thrown in river.*

time spent setting up the machinery. Even on a twenty-four-hour work shift, this is but three hours short of forty-five straight days of machining!

Here the story of gun number S-89 ends, so far as available official records indicate. The battle for Mobile raged for over eight months from August 5, 1864, until April 12, 1865. What part gun number S-89 played in the engagement is lost to history, but the Confederacy was in desperate need of cannon and it is not likely that S-89 did not play its part. It is known that the gun was at Fort Stonewall at the end of the war. Many years later it was moved to Montgomery and placed at the entrance to Maxwell Air Force Base. It later was moved to Fort Morgan, its present location.

The Selma Cannon Foundry continued to produce Brooke guns right up to within a few weeks of the war's end. The gun with the largest serial number, S-125, and the only eleven-inch rifle gun made at Selma, was shipped on March 17, 1865, and was used at Fort Huger on Mobile Bay against Federal forces in their advancement against Spanish Fort.

The modest beginning of the Selma arsenal in 1861 had grown into a manufacturing conglomerate that covered over fifty acres and employed in excess of 10,000 people in the various factories. The arsenal at Mount Vernon, to the south of Selma, had been moved to Selma and added the production of uniforms, knapsacks, and similar equipment to the flow of war materiel from Selma. It has been estimated that in the last two years of the war, Selma contributed fully half of the cannon and two-thirds of the fixed ammunition used by Confederate forces. It had grown so large and contributed so much to the Confederacy that it became a prime target for Union forces.

Twice before, Union raiding parties had made a strike toward Selma, but had been diverted or driven back. In the Spring of 1865, Union General James H. Wilson began a drive with 15,000 troops from the northwest corner of Alabama toward Selma. He was opposed by Confederate General Nathan Bedford Forrest with 2500 cavalrymen. Although vastly outnumbered, the Confederates fought an intense delaying action battling across the northern half of Alabama.

The gunmakers of Selma continued their work almost up to the sound of Union guns. They completed and shipped by riverboat a final seven-inch rifled Brooke gun, No. S-103, on March 22, 1865. Selma fell to Wilson's troops just eleven days later on April 2, 1865. This is the same day that Richmond and the Tredegar Foundry and Iron Works fell. It is ironic that the two manufacturing locations for Brooke guns ceased operations on the same day.

The Confederate forces had begun the evacuation of the equipment from the Selma factories to the west by railroad and down the Alabama River on steam boats as the Union forces approached. Commander Jones had requested instructions as to where to try to reestablish the foundry, but having received no answer, he went down the Alabama River to its junction with Tombigbee River and up to Gainesville, Alabama. It was there that he learned of General Lee's surrender and that the attempt to establish the Confederate Government had failed.

The story of the Brooke guns does not end here. Brooke, Jones and Robert D. Minor formed a partnership to offer their services to foreign governments interested in their ordnance skills. The government of Peru engaged them and they spent almost a year in Lima, Peru, assisting in land fortifications and ship armament. They then returned to the United States and continued the partnership for a few more years. Armament was changing rapidly and the days of the muzzleloading cannon were drawing to a close. The partnership was dissolved and Brooke accepted a professorship at Virginia Military Institute and Jones returned to Selma to enter private business.

Selma reverted to a typical southern agricultural town. Few tourists passing through its quiet, oak-shaded streets today know that, for four years, it was a manufacturing heart pumping war implements into the bloodstream of the Confederacy, and that its Brooke guns spoke its name over battlefields that are legends today.

# CATALOG OF BLACK POWDER —KITS

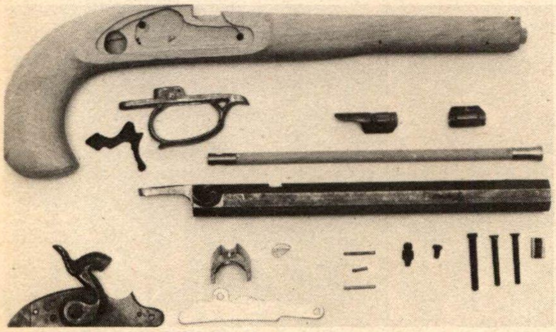
*Muzzleloaders in kit form are available today from practically all of the major manufacturers and importers, and the following products represent just a sampling of those offered.*

*If there's a particular favorite of yours that isn't listed, it is suggested that you write direct to one or more of the black powder gun dealers listed in this directory beginning on page 279.*

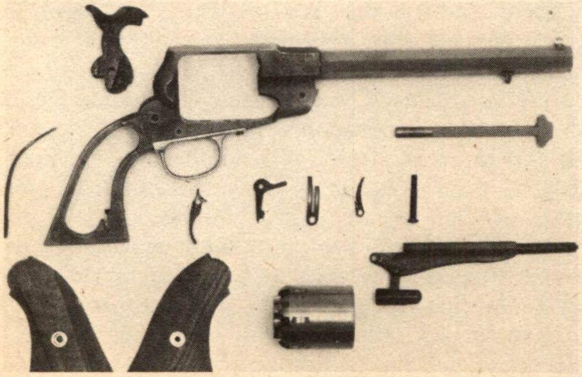
## HAND GUNS

ARMOURY 1851 Colt Navy Revolver — In .36 caliber with 7½-inch barrel and overall length of 13 inches. Brass frame, octagonal rifled barrel. Weighs 42 ounces. $49.95.

ARMOURY Corsair Double-Barrel Pistol — In .36 caliber with 8½-inch barrels and overall length of 13¾ inches. Walnut stock, rifled barrels. $69.95. In .44 caliber, $69.95.

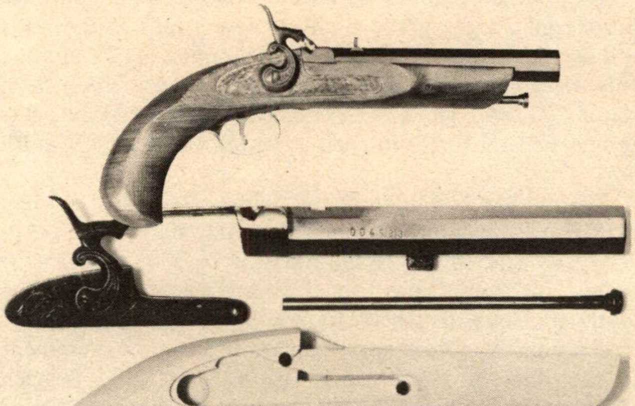


ARMOURY Full-Stock Kentucky Pistol — Ten inch, deep-rifled barrel and overall length of 15 inches. Barrel weight of 22 ounces, complete kit weighs 44 ounces. Lock with bridle. All metal screws and holes fully drilled and tapped. Bolsters on percussion model. Percussion, $49.95. Flintlock, $54.95.

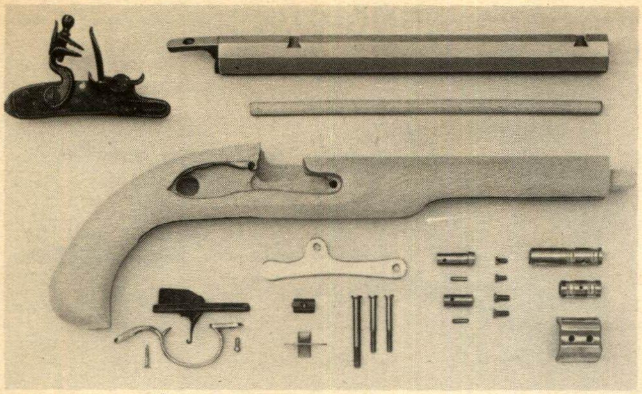


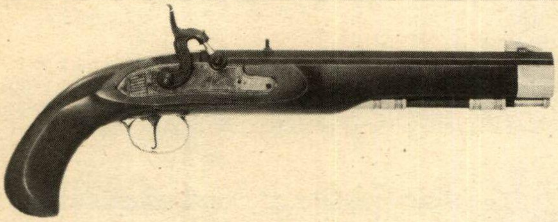
ARMOURY Remington New Model Army — In .44 caliber with 8-inch barrel, overall length of 14¾ inches and weight of 41 ounces. All parts machine finished. $79.95.


CLASSIC ARMS Snake Eyes Double Derringer — In .36 caliber with brass frame and side-by-side barrels, steel hammers and trigger guard. $49.95.

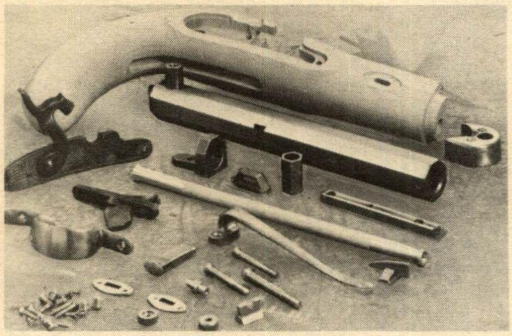


CVA Colonial Pistol — In .45 caliber with 6½-inch octagonal rifled barrel with rear sight dovetail. Semifinished stock 95 percent inletted. Weighs 30 ounces and overall length is 12 inches. Percussion, $28.95. Flintlock, $34.95.

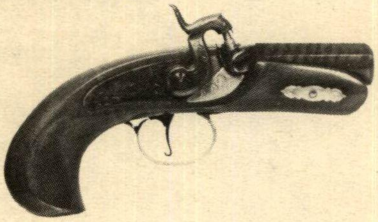


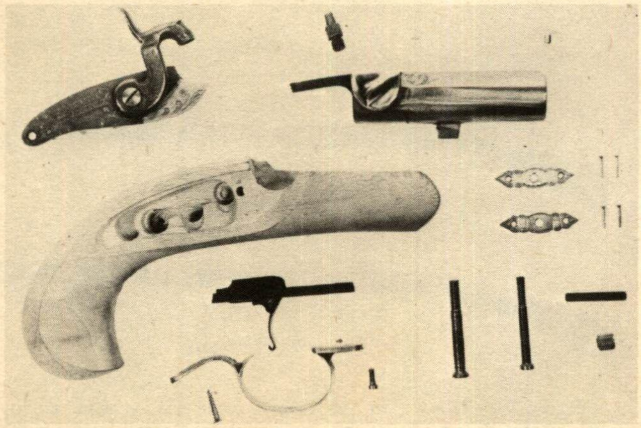


CVA Kentucky Pistol — In .45 caliber with color case-hardened Kentucky lock and fully rifled octagonal barrel, measures 10¼ inches overall. Brass parts are polished, stock is fully formed and 95 percent inletted. Percussion, $40.95; Flintlock, $46.95.

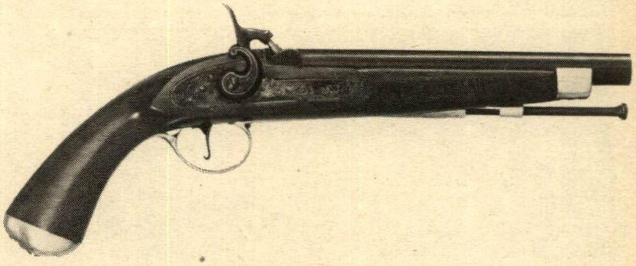


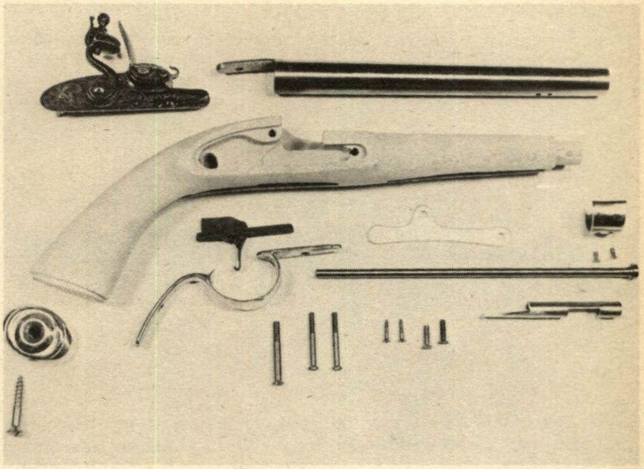
CVA Mountain Pistol — In .45 and .50 caliber percussion with 9-inch octagonal barrel, 15/16-inch across the flats. Fully formed and 95 percent inletted American-made maple stock. Steel furniture with exception of pewter-type nose cap. $49.95.





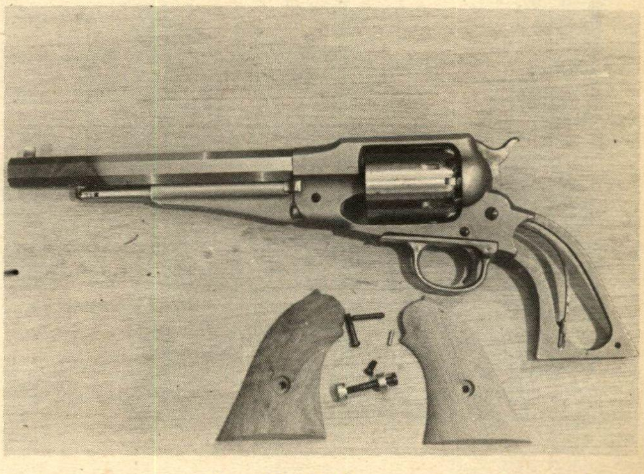
CVA Philadelphia Derringer — In .45 caliber with coil spring and back-action lock. Fully formed and 95 percent inletted stock. Requires only final fitting and finishing. $23.95.



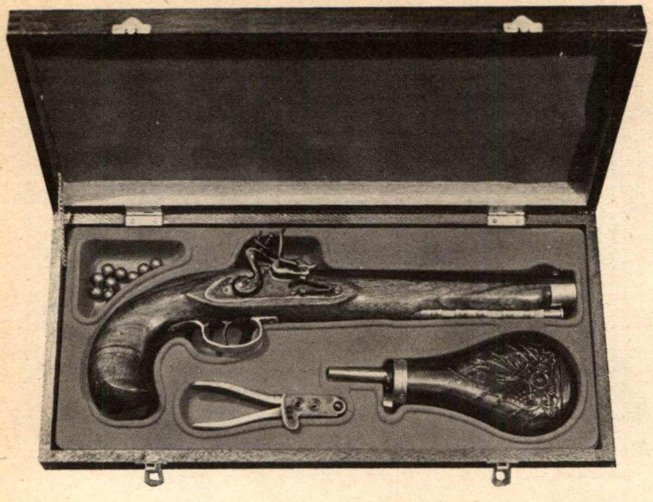


CVA Tower Pistol — Based on British issue Horse Pistol and named after the Tower of London where they originally were assembled, comes in .45 caliber 95 percent inletted. Percussion, $40.95; Flintlock, $46.95.

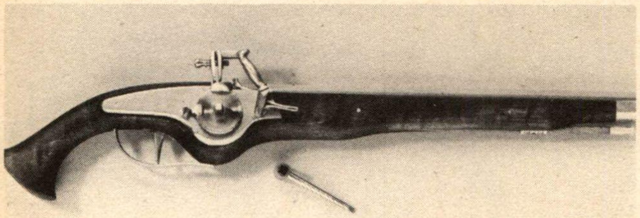
DIXIE GUN WORKS 1849 Hartford Revolver — In .31 caliber with 6-inch octagonal barrel rifled to fire a .321 round ball, this 5-shot pocket revolver comes preassembled. Has steel frame, brass trigger guard and backstrap, and case-hardened hammer. One-piece walnut grips. $45.



EMF Remington .44 New Model Army — Comes functional and complete except for grips, grip nuts, grip screw and grip pin. Available with either brass or steel frame. $75.00.



HAWES Kentucky Pistol — In .44 caliber flintlock or percussion. One-piece breech plug and tang. (Illustrated with optional case and accessories.) Percussion, $59.95; Flintlock, $55.95.



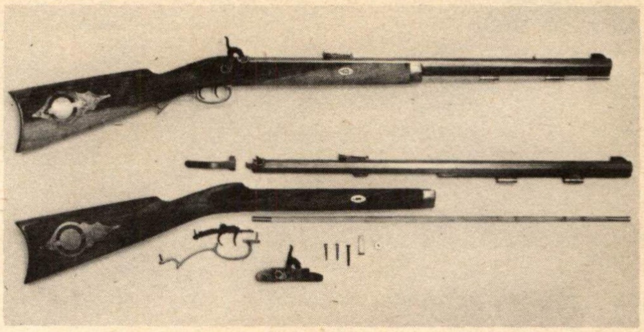
MARKWELL ARMS German Wheel-Lock Pistol — In .45 caliber with 15¾-inch barrel and overall length of 23¼ inches. Has walnut stock, no sights and weighs 69 ounces. Replica of Sixteenth Century German version, $191.95.


MARKWELL ARMS Loyalist Target Pistol — Single-shot percussion in .45 caliber with 10-inch barrel. Brass front sight with round-bead top and fully adjustable steel rear sight. $86.95.

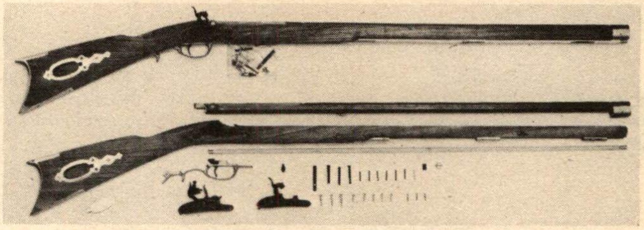
NAVY ARMS Griswold & Gunnison Revolver — All metal parts in the white but completely milled. Rifled barrel and all screw holes have been drilled and tapped. $45.00.

NAVY ARMS Remington Revolver — In .45 caliber percussion with 8-inch rifled barrel. All parts in white but completely milled. Screw holes drilled and tapped. $60.00.

## LONG GUNS

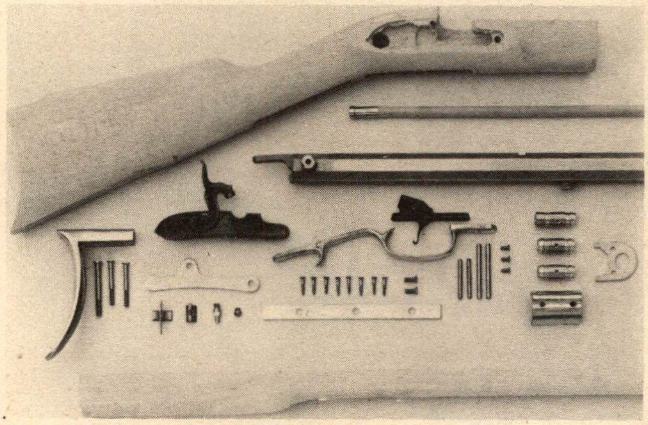


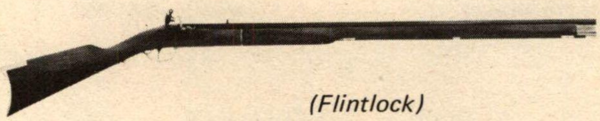
ARMOURY Hawken Rifle — In .45, .50 and .54 calibers with 29-inch barrel and overall length of 45¾ inches. Walnut stock with cheek piece, fully adjustable rear sight and dovetailed front sight, brass furniture and fully inletted patchbox. Percussion, $130.



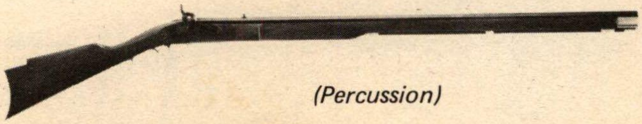
ARMOURY Full One-Piece Stock Kentucky Rifle — In .45 or .50 calibers with 36-inch barrel and overall length of 50 inches. One-piece, exactly inletted stock, dovetailed open rear sight, Kentucky-style blade front sight, wood ramrod brass tipped at both ends and threaded at bottom end. Percussion, $138.40. Flintlock, $142.10.

ARMOURY One-Piece Stock Kentucky Rifle — In .45 caliber with rifled barrel and fully inletted patchbox. Percussion, $99.50.



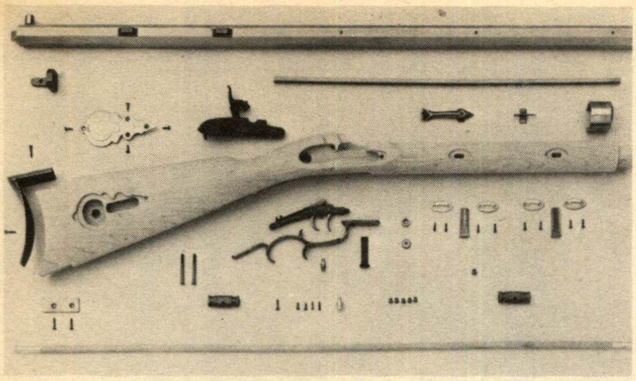


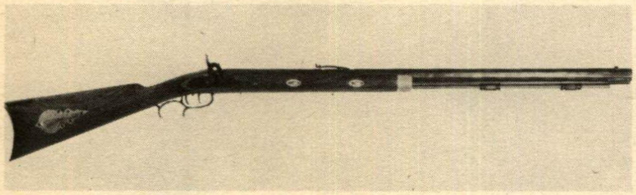
*(Flintlock)*



*(Percussion)*

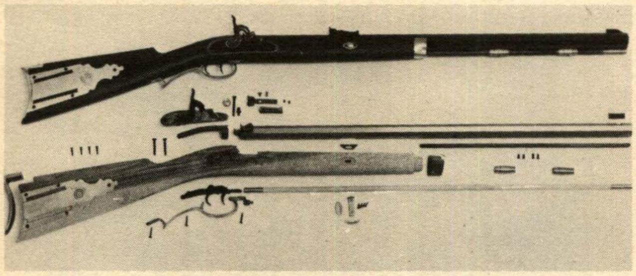
CVA Kentucky Rifle — In .45 caliber with deep-groove, rifled, 32-inch octagonal barrel 7/8-inch across flats. Overall length is 50 inches and weight is 7 pounds. Percussion, $72.95; Flintlock, $79.95.



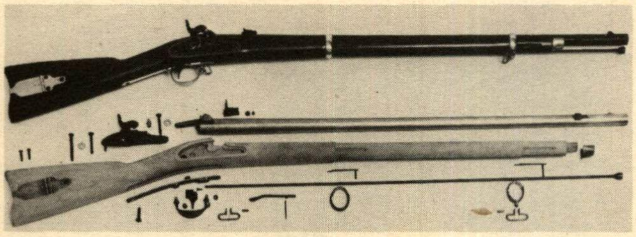


CVA Mountain Rifle — In .45 and .50 calibers with 32-inch octagonal barrel, 15/16-inch across the flats. American maple stock is 95 percent inletted and deep-grooved, custom barrel is rifled one turn in 66 inches. Weighs 8 pounds and overall length is 48 inches. Percussion, $125. Flintlock, $132.

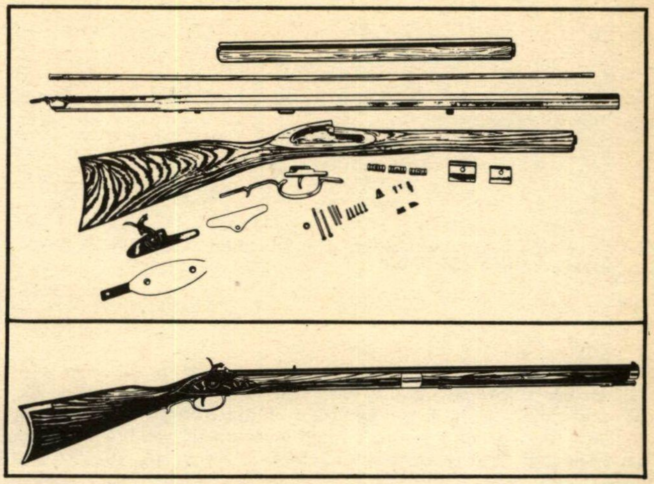
DIXIE GUN WORKS Pennsylvania Lancaster County Rifle — One-piece maple stock with 95 percent of inletting completed. Barrel is 36 inches long, about 7/8-inch octagon, in .45 caliber only. Easily assembled by the beginner and conversion kits are available to change from flintlock to percussion or vice versa for about $25. Percussion, $89.95; Flintlock, $95.00



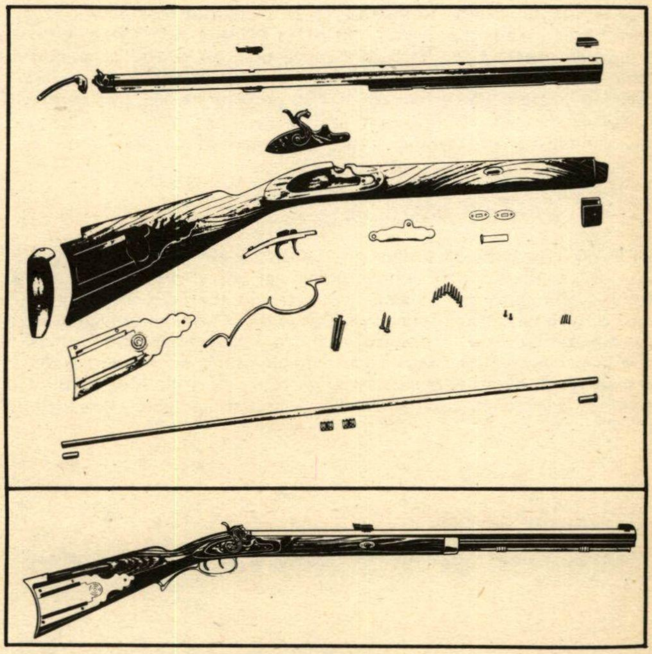
LYMAN Plains Rifle — In .54 and .58 calibers with 28-inch rifled barrel, drilled, tapped and dovetailed as needed. Shaped and 90 percent inletted walnut stock. Fully assembled and color case-hardened lock featuring durable coil mainspring. Assembled and blued adjustable double-set triggers. Percussion, $169.95.



LYMAN Zouave Rifle — In .58 caliber rifled barrel with front and rear sights installed and bayonet lug attached. Fully shaped and 95 percent inletted hardwood stock. Assembled and color case-hardened lock. Percussion, $149.95.



MARKWELL ARMS Primitive Kentucky Rifle — In .45 caliber with 32½-inch barrel and overall length of 50 inches. Color case-hardened lock, front and rear dovetail sight, brass-tipped ramrod and brass furniture. Percussion, $74.95.



MARKWELL ARMS Super Hawken Rifle — In .50 caliber with 28-inch octagonal barrel and overall length of 43 inches. Walnut stock, color case-hardened lock, adjustable rear click sight, blade dovetail front sight. Hooked-breech, double-set adjustable triggers and large brass patchbox. Percussion, $124.95.

NAVY ARMS Brown Bess Musket — All metal parts finished with exception of brass furniture. Stock is 80 percent finished with lock completely inletted. Flintlock, $195.00.

NAVY ARMS Charleville Musket — Almost completely inletted. Metal parts need some polishing. $195.00.

NAVY ARMS Hawken Rifle — In .45, .50 and .58 calibers. American black walnut stock, solid-cast brass fitting. Locks completely inletted with butt plate and nose cap installed. Barrel channel completely inletted. Percussion, $125.00.

NAVY ARMS Magnum Shotgun — In 12 gauge, comes with engraved locks. $165.00.

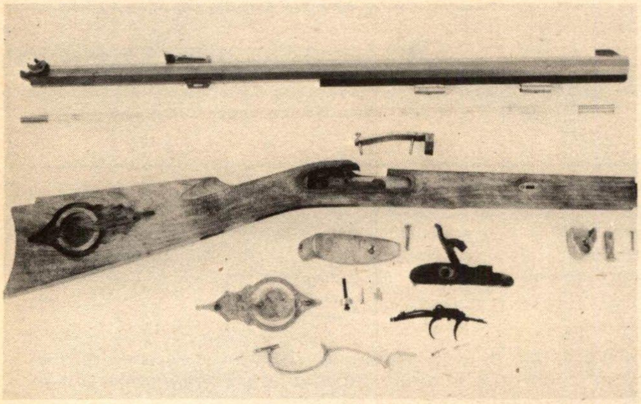
NAVY ARMS Morse Rifle — All parts machined and ready for final assembly and finishing. American walnut stock. Available in .45, .50 and .58 calibers. $75.00.

NAVY ARMS Springfield Rifle — In .58 caliber with 40-inch barrel, no tapping required. $140.00.

OLD WEST ARMS English Fowling Piece — In 10 or 12 gauge with 32-inch barrel interchangeable with rifle barrels in calibers .50, .54, .58 and .62. Short tang, two-piece hooked breech drilled for standard Ampco nipple, breech plugs investment cast in 4140 alloy. Hand-selected American walnut stock 95 percent shaped and inletted, barrel channeled 100 percent and drilled for ramrod. Investment cast all-steel lock and trigger parts. Percussion, $235.

OLD WEST ARMS J&S Hawken Full-Stock Rifle — In .50, .54, .58 and .62 calibers with 36-inch barrel drilled from solid high-quality barrel steel, reamed and then cut-rifled to .012 inches deep with a 1:72-inch twist. Long tang, one-piece breech drilled for standard Ampco nipples, breech plugs investment cast in 4140 alloy. Hand-selected Eastern hard maple stock 95 percent shaped and inletted, barrel channeled 100 percent and drilled for 7/16-inch ramrod. Investment cast all-steel lock and trigger parts. Percussion, $280.

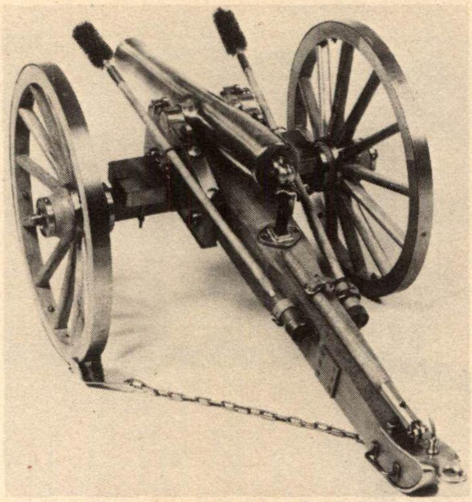
OLD WEST ARMS J&S Hawken Half-Stock Rifle — In .50, .54, .58 and .62 calibers with 34-inch octagonal barrel drilled from solid stock high-quality barrel steel, reamed and then cut-rifled to .012 inches deep with a 1:72-inch twist. Two-piece hooked breech drilled for standard Ampco nipple, breech plugs investment cast in 4140 alloy. Hand-selected Eastern hard maple stock 95 percent shaped and inletted, barrel channeled 100 percent and drilled for 7/16-inch ramrod. Investment cast, all-steel lock and trigger parts. Percussion, $250.

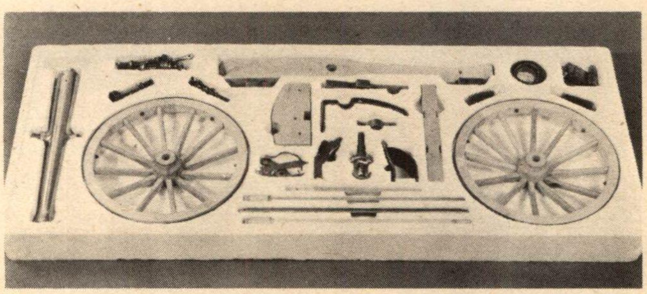


SHORE Hawken Percussion Rifle — Styled after Hawken Plains rifles, has stainless-steel nipples, hard-chrome bore. .50 caliber, $159.95.

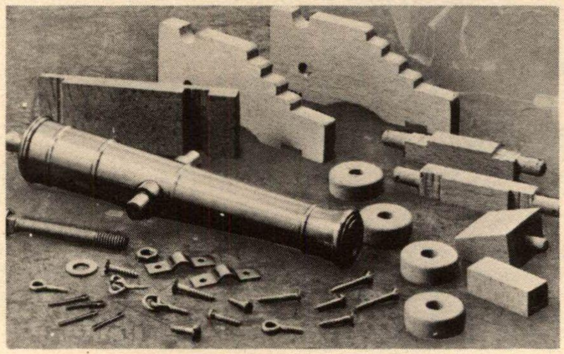
THOMPSON/CENTER ARMS Hawken Rifle — In .45 and .50 calibers. All inletting for the barrel, tang, trigger, lock, butt plate, patchbox, escutcheons and forend cap is complete. Metal in white, rifled barrel fully threaded for breech plug which fits exactly to the hooked-breech tang section. Lock fully assembled and all trim is solid brass. First-grade American walnut stock. Available in either caliber in percussion or flintlock. Percussion, $140; Flintlock, $150.

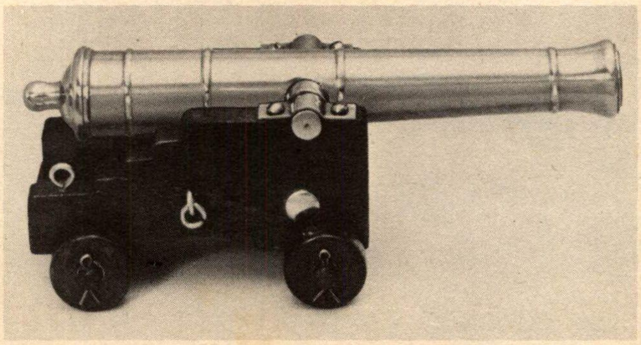
## CANNON





CVA Napoleon III Cannon — In .75 caliber with 14½-inch barrel and overall length of 27 inches. Weighs 18 pounds and wheel diameter is 11½ inches. Kit includes two ramrods with steel collars and cleaning brushes, two steel ammunition boxes, wheel chock and chain, and three leather hold-down straps. $139.95.





CVA Old Ironsides Cannon — In .45 caliber with 7½-inch rifled barrel and overall length of 8 inches. Weighs 22 ounces. $24.95.

# BLACK POWDER DIRECTORY

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Lever Arms Serv. Ltd., 771 Dunsmuir St., Vancouver, British Columbia, Canada V6C 1M9
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Colt, 150 Huyshope Ave., Hartford, CT 06102
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Golden Age Arms Co., 14 W. Winter St., Delaware, OH 43015
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Ithaca Gun Co., Ithaca, NY 14850
Kindig's Log Cabin Sport Shop, R.D. 1, P.O. Box 275, Lodi, OH 44254
Lever Arms Service Ltd., 771 Dunsmuir, Vancouver, British Columbia, Canada V6C 1M9
Edw. E. Lucas, 32 Garfield Ave., East Brunswick, NY 08816 (45-70)
Lyman Gun Sight Products, Middlefield, CT 06455
R.M. Marek, Rt. 1, Box 1-A, Banks, OR 97106 (cannons)
Markwell Arms Co., 2413 W. Devon Ave., Chicago, IL 60645
W.L. Mowrey Gun Works, Inc., Box 711, Olney, TX 76374
Navy Arms Co., 689 Bergen Blvd., Ridgefield, NJ 07657
Numrich Arms Co., West Hurley, NY 12491
The Outrider, Inc., 3288 LaVenture Dr., Chamblee, GA 30341
Potomac Arms Corp., P.O. Box 35, Alexandria, VA 22313
Replica Models, Inc., 610 Franklin St., Alexandria, VA 22314
Richland Arms Co., 321 W. Adrian St., Blissfield, MI 49228
Riflemen's Hdqs., Rt. 3, RD 550-E, Kendallville, IN 46755
S&S Firearms, 88-21 Aubrey Ave., Glendale, NY 11227
SAECO-Darr Rifle Co. Ltd., 525 Maple St., Carpinteria, CA 93013 (S.S. items)
South Bend Replicas, Inc., 61650 Oak Road, South Bend, IN 46614
C.H. Stopler, 1426 Walton Ave., New York, NY 10452 (miniature guns)
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Tingle, 1125 Smithland Pike, Shelbyville, IN 46176 (muzzleloader)
Trail Guns Armory, 2115 Lexington, Houston, TX 77006 (muzzleloaders)

Ultra-Hi Products, 150 Florence Avenue, Hawthorne, NJ 07506
Vintage Arms, Inc., 10 Everett Ave., Belchertown, MA 01007
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Anderson Mfg. Co., P.O. Box 3120, Yakima, WA 98903
Armoury, Inc., Rt. 202, New Preston, CT 06777
Dan Barr, Rt. 1, Thornville, OH 43076 (hunting bag)
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Blue and Gray Prods., Inc., 817 E. Main St., Bradford, PA 16701
Jesse F. Booher, 2751 Ridge Ave., Dayton, OH 45414
G.S. Bunch, 7735 Garrison, Hyattsville, MD 20784 (flask repair)
Pat Burke, 3339 Farnsworth Rd., Lapeer, MI 48446 (capper)
Butler Creek Corp., Box GG, Jackson, WY 83001 (poly patch)
Caution Tool Co., Scout Rd., Southbury, CT 06488
Challanger Mfg. Co., 118 Pearl St., Mt. Vernon, NY 10550 (Hopkins & Allen)
R. MacDonald Champlin, P.O. Box 74, Wentworth, NH 03282 (custom muzzleloaders)
Cherry Corners Gun Shop, Rt. 1, 8010 Lafayette Rd., Lodi, OH 44254
Chopie Mfg., Inc., 531 Copeland Ave., La Crosse, WI 54601 (nipple wrenches)
Classic Arms Intl., Inc., 20 Wilbraham St., Palmer, MA 01069 (guns and kits)
Cornwall Bridge Gun Shop, Cornwall Bridge, CT 06745
Earl T. Cureton, Rt. 2, Box 388, Willoughby Rd., Bulls Gap, TN 37711 (powder horns)
DJ Inc., 1310 S. Park Rd., Fairdale, KY 40118
John N. Dangelzer, 3056 Frontier Pl. N.E., Albuquerque, NM 87106 (powder flasks)
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Dixie Gun Works, Inc., P.O. Box 130, Union City, TN 38261
EMF Co., Inc., 2911 West Olive, Burbank, CA 91505
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Euroarms of America, Inc., 14 W. Monmouth St., Winchester, VA 22601
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Firearms Imp. & Exp. Corp., 2470 N.W. 21st St., Miami, FL 33142
Flintlocks, Inc., RR 2, Box 160, Russiaville, IN 46979
Clark K. Frazier/Matchmate, RFD 1, Rawson, OH 45881
Golden Age Arms Co., 14 W. Winter St., Delaware, OH 43015
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Green River Forge, 4326 120th Ave. S.E. Bellvue, WA 98006 (Forge-Fire flints)
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International ML Parts Co., 37370 Jefferson Ave., Mt. Clemens, MI 48043
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Williamson-Pate Gunsmith Serv., 6021 Camp Bowie Blvd., Ft. Worth, TX 76116
York County Gun Works, RR 4, Tottenham, Ontario, L0G 1W0, Canada (locks)
R.E. Zellmer, W180 N8996 Weona Ln., Menomonee Falls, WI 53051 (Kentucky fullstocks)

## MISCELLANEOUS

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Flat Springs, Alamo Heat Treating Co., Box 55345, Houston, TX 77055
Nipple Wrenches, Chopie Mfg., Inc., 531 Copeland Ave., La Crosse, WI 54601
Powder Horns, Thos. F. White, 5801 Westchester Ct., Worthington, OH 43085
Powder Storage Magazine, C & M Gunworks, 2603 41st St., Moline, IL 61265
Rust Bluing/Browning, L.B. Thompson, 586 E. School Ave., Salem, OH 44460
Salute Cannons, Naval Co., Rt. 611, Doylestown, PA 18901
Shooting/Testing Glasses, Clear View Sports Shields, P.O. Box 255, Wethersfield, CT 06107
Shooting Glasses, Bausch & Lomb, Inc., 635 St. Paul St., Rochester, NY 14602
Shooting Glasses, Bushnell Optical Corp., 2828 E. Foothill Blvd., Pasadena, CA 91107
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Shooting Glasses, Ray-O-Vac, Wilson Prods. Div., P.O. Box 622, Reading, PA 19603

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*(Each includes a magazine with the membership)*

National Muzzle Loading Rifle Association, Box 67, Friendship, IN 47021. $6.00/year.
National Rifle Association, 1600 Rhode Island Ave., N.W., Washington, DC 20036. $10/year.
Western States Muzzle Loaders Association, 414 E. Grand Ave., El Segundo, CA 90245. $4.50/year.
North-South Skirmish Association. Address inquiry to Chas. M. Hunter, 6214 - 29th Street, N.W., Washington, DC 20015.
The American Mountainmen, P.O. Box 259, Lakeside, CA 92040. $4.00/year.

# GLOSSARY OF BLACK POWDER TERMS

**ACID ETCHING:** A process of marking gun barrels that was common to the early 1800s. The metal surface first was coated with wax; the initials or name then was scribed through the thin layer of wax, until the metal that would bear the markings was exposed. A minute amount of acid then was applied to the etched lines and this would discolor the exposed metal. The process was not permanent and was abandoned for the most part in the search for a better way to mark gun barrels.

**AMPCO NIPPLE:** A modern design percussion nipple made of beryllium, an alloy that résembles brass but is much harder and more resistant to erosion of the flashhole. Ampco nipples feature an extremely small flashhole at the bottom; this results in a hotter flame, as the fire concentrates to pass through the tiny opening. The hotter ignition flame, in turn, ignites the powder more readily in the breech, giving a more spontaneous ignition than with ordinary nipple designs.

**APERTURE SIGHT:** Often referred to as a peep sight, because it requires the shooter to visually center the front sight in the center of a small, round hole in the rear sight while aiming. This arrangement makes it one of the most accurate metallic sights.

**APPLEWOOD:** Occasionally used in the making of gunstocks. The fine grain of this wood resists warpage and a rifle so stocked maintains its zero. Applewood is one of the easiest to work with, rounding and shaping nicely; inlays also are installed easily in a stock made of this wood.

**ARQUEBUS:** An early term for matchlock shoulder guns. The term originated from the German word Hakenbuchse, meaning hook gun. The French equivalent to hook, or Haken, is arque. The German Buchse, or gun, became a suffix to be tacked onto the end of the French word and, by the turn of the 16th Century, all such guns were known as arquebuses.

**BACK ACTION LOCK:** A later type of percussion lock. A true side-lock, this type of lock features a mainspring that is to the rear of the tumbler and hammer.

**BALL:** Spherical lead projectile used most commonly in the majority of the muzzleloading rifles and nearly all black powder pistols and cap and ball revolvers. In many cases a certain size of buckshot works well in such guns of a caliber of the same size; the shot then becomes a ball, being loaded one at a time.

**BALL AND SWAN DROPS:** A combination load consisting of a ball over which were a number of the large shot used in swan hunting, approximately .27 caliber, followed by a wad. Used occasionally in coach pistols against highwaymen and (in certain areas) in the earlier formal pistol duels.

**BALLISTICS:** The science of a projectile's actions after the propellant's explosion and the various factors which influence its accuracy, speed, trajectory and energy.

**BALL SCREW:** Resembling a wood screw, this attachment threads into the end of the ramrod and is used for removing the ball from an unfired loaded round. The threaded point of the ball screw digs into the soft lead of the ball and grips it firmly enough so that it can be pulled from its seating and through the length of the barrel.

**BALL STARTER:** A short ramrod normally no longer than the bore diameter, used to start the ball down the muzzle without the binding sometimes experienced with the longer ramrods.

**BALTIC LOCK:** Crude and early version of the flintlock. Guns fitted with this type of lock appeared around 1600. Design soon was replaced with advanced versions of the flintlock.

**BAND SPRING:** The spring attached to barrel bands on a musket to hold them securely in place. To remove these bands, the band springs are depressed and the bands slip off.

**BAR ACTION:** The more common of the side locks; the mainspring of this lock is in front of the tumbler and hammer.

**BARLEYCORN:** A conventional early front sight of simple-bladed type, very low in height. So named because its shape often suggested a barley grain before threshing.

**BARREL:** The metal tube from which the projectile emerges upon firing.

**BARREL BAND:** One of the several bands holding barrel and forend together on most military muskets.

**BARREL KEY:** The wedge-shaped flat key that holds the barrel assembly to the forestock on many half-stock rifles and shotguns.

**BARREL PIN:** A round metal pin which fastens barrel to forend, usually on earlier full-stock arms.

**BAYONET:** A metal knife-like blade – occasionally doubling as a knife – made to be attached to the muzzle of a shoulder arm and used in hand-to-hand combat.

**BELTED ROUND BALL:** A special design lead ball that was purposely cast with a raised belt of lead around its circumference. Belted round balls were mechanically started into the muzzles of deep, two-groove rifled bores found on many of the British rifles. The belted ring acted as a gas seal, at the same time being guided through the length of the barrel by the rifling groove on the bullet caused by the mechanical starter. The result was a bullet that was somewhat faster and more accurate than the standard patched ball.

**BENCH RIFLE:** A heavy muzzleloading target rifle especially designed and built for firing from a benchrest with the shooter seated.

**BLACK POWDER:** A mixture of potassium nitrate, charcoal and sulphur. Combined, these ingredients form the standard propellant for muzzleloading guns.

**BLUNDERBUSS:** Arms of this type were used most commonly aboard ships to repel boarders during Naval conflicts. The blunderbuss featured a flared muzzle that probably was just as frightening to anyone unfortunate enough to view it from that angle as it was deadly. Although it is doubtful that such a flared muzzle did actually spread the shot any considerable amount over a gun with just a straight cylinder choke, it was nonetheless a deadly close-range gun.

**BOOT:** A water-resistant leather cover that fits over the flash pan of a flintlock rifle. The shield sheds rain and helps keep the priming powder in the pan dry during inclement weather.

**BOOTLEG:** A slender muzzleloading pistol, usually with a compact underhammer action, which could be carried inside a boot if desired.

**BORE:** The drilling or hole through which the bullet or load of shot travels the length of the barrel.

**BORE BUILD-UP:** Continuous firing of a black powder rifle, pistol or shotgun will result in a build-up of powder foulings in the barrel. For regular target practice, aligning of sights or just plinking, this is cleaned out usually after a dozen or so shots with a few swipes of a solvent-soaked rag and a jag threaded into the ramrod. Serious competitors, however, often wipe the barrels of their guns after every shot.

**BORE GAUGE:** An instrument for determining the exact diameter of a bore.

**BORE SIGHTING:** Adjusting of the sights to coincide exactly with a point upon which the bore is aligned at a given distance. With a muzzleloader, this may be done by removing barrel and breech plug.

**BOX LOCK:** The hammer on this type of lock is fastened on the inside and projects above it.

**BREECH:** The rear end of a muzzleloader's barrel; the area occupied by the loaded round.

**BREECH PLUG:** The threaded plug that is screwed into the breech end of a muzzleloader's barrel. This forms a gastight seal and is actually the rear or bottom of the chamber; the barrel tang usually is attached to the breech plug.

**BREECH (CHAMBER) PRESSURE:** As the loaded charge of powder is ignited and rapidly burns it results in trapped gases (which create pressure) which push the projectile up the barrel. The pressure caused by these gases is known as the breech pressure and is measured in pounds per square inch – psi.

**BREECH SEAL:** A metal or plastic seal which is designed to provide obturation to an arm such as a Civil War breechloading carbine so that it may be used as a muzzleloader.

**BRIDLE:** A plate that provides support for the inside end of those screws upon which the sear and tumbler pivot in a conventional lock.

**BROWN BESS:** Smoothbore flintlock musket used by the British forces during the Revolutionary War. The long barrel and approximately .75 caliber made it fairly accurate and a hard-hitting military arm.

**BROWNING:** An oxidation process for finishing barrels and metal parts, which predated modern bluing.

**BUCK AND BALL:** A musket load as sometimes used in the Civil War, usually consisting of one spherical musket ball behind three buckshot. A deadly short-range load.

**BUCKSHOT:** Large spherical shot commonly used for big-game hunting, combat and riot control. Shot ranging in sizes from .240 to .330 is occasionally used for loading muzzleloading rifles and pistols.

**BUGGY RIFLE:** Sometimes appearing in the form of a long-barreled single-shot pistol; many short-barreled, lightweight rifles were commonly carried for protection, hunting small game and target shooting during the second half of the 1800s. These were known as buggy rifles and were usually of around .36 caliber, though there were many sawn-off military rifled muskets of around .58 caliber used for this purpose also.

**BULLET:** It is a common practice to refer to an entire cartridge as the bullet. Actually the bullet is just the lead projectile that is fired from the assembled cartridge.

**BULLET MOLD:** A metal tool containing a cavity or cavities for the casting of lead balls or other firearm projectiles.

**BULLET PATCH:** A patch of cloth, buckskin or similar material surrounding a ball in a muzzleloader bore, which engages the rifling and serves as a gas seal.

**BUTT MASK:** On earlier pistols, a metal butt cap representing a grotesque face.

**BUTT PLATE:** A protective metal plate on the rear of a buttstock.

**BUTTSTOCK:** The widening portion of the wooden stock which goes against the shoulder.

**CALIBER:** The nominal diameter of the bore of a firearm expressed in thousandths of an inch.

**CANNELURE:** A shallow groove around the circumference of a conical bullet used as a means of lessening bullet resistance to rifling.

**CAP BOX:** Usually appearing as a hinged compartment on the butt stock of a rifle or shotgun, the cap box is exactly as the name suggests: a place to carry caps. It may, however, be located in places other than the buttstock and in some pistols is in the butt of the grip. The term also was used to describe a small leather belt pouch used during the Civil War for carrying musket caps.

**CAPLOCK:** A term often used to describe a percussion lock.

**CARBINE:** A shortened rifle; although usually not as accurate as rifles with longer barrels, the carbine is easier to maneuver when hunting or shooting in brushy areas.

**CARTRIDGE BOX:** For our purposes, the leather pouch in which musketeer carries paper or combustible cartridges.

**CAST-OFF:** A variation to the right in a gun stock from alignment with the barrel to better fit a right-handed shooter. To the left for a southpaw is called cast-on.

**CAST-ON:** Shaping of a gunstock that aligns the barrel of a gun to the left of what is considered normal alignment. This aids in sighting and shooting for the southpaw. When the alignment is in the other direction – to the right – for aiding a right-handed shooter, it is termed, "cast-off."

**CHAMBER:** Although not commonly found in muzzleloaders in the true sense, a chamber is the unrifled portion of a barrel that holds the loaded round.

**CHARGER:** A term used to describe anything – flask, horn, dipper, et al. – that measures out one exact charge of powder.

**CHECKERING:** The decorative roughening of a handgrip and/or forend. Seldom seen on muzzleloaders except for shotguns and some duelling pistols.

**CHEEK PIECE:** A raised portion behind the comb of a stock to align the eye with the sights.

**CHERRY:** A steel burr that has cutting edges running its vertical circumference or length, of an exact size. These are used to cut the cavities of bullet moulds. An old practice was to clamp a cherry between two pieces of soft iron or any other suitable metal in a vise. The elongated shank connected to the cherry was turned in the direction of the cutting edges until they had cut away enough metal for the cherry to turn freely. The vise then was tightened further and the process repeated until a cavity the exact proportion of the cherry had been formed.

**CHOKE:** The constriction near the muzzles of shotguns to control the range at which an ideal pattern occurs. Different chokes are desirable for different conditions. Fine custom-made muzzleloading rifles are often given a touch of choke for superior accuracy.

**CLEANING PATCH:** A cloth patch, usually flannel, for wiping the bore between shots or thorough cleaning after the day's firing.

**COACH PISTOL:** Usually a smoothbore, this was a pistol once carried by travelers for protection. Not recommended for target accuracy.

**COCK:** The action of drawing back the hammer. Also an early term for the hammer of a flintlock.

**COMB:** The raised top of a stock just back of the wrist or trigger-hand grip.

**COMBUSTIBLE CARTRIDGE:** Muzzleloading cartridge that contains the powder and projectile rolled in a paper casing. This paper is nitrated and the entire unit is loaded into the gun, the paper being completely combustible.

**CONE:** An early term for a percussion nipple.

**CORNED POWDER:** An early attempt to form black powder into grains, powder of this type was crude and grain sizes were inconsistent.

**CORROSION:** The worst enemy of muzzleloading guns; the deterioration of metal parts through chemical reaction or oxidation.

**CREEP:** The erratic, rough pull of a trigger when sear and tumbler notches have not been properly stoned smooth.

**CULOT:** An expanding wedge made of iron that was originally used in the hollow base of the Minie bullet. This wedge was abandoned by American shooters.

**CURLY MAPLE:** Early gunsmiths favored this wood for stocking Kentucky and Pennsylvania rifles. The best wood comes from trees that have grown to maturity in hard and rocky soil; this results in a fine-grained dense wood. The popularity of this wood is still seen in today's black powder rifles.

**C-SHAPED SERPENTINE:** An early matchlock, as the term implies, a lock of this type was fitted with a C-shaped cock, which ignited the primed flash pan by being struck rearward mechanically.

**CYLINDER:** The revolving multi-chambers of a percussion revolver; these commonly had six chambers, but those with five are not uncommon.

**CYLINDER BORE:** The unrestricted bore of a shotgun, having no choking at all; improved-cylinder barrels have been choked slightly to to improve patterns.

**DAG:** An early English term used to describe any massive, heavy and powerful pistol. Its origin is unknown.

**DAMASCUS BARRELS:** Early barrels formed by welding together strips of various steels. These were wrapped and hammer forged around a mandrel that was the same diameter as the intended finished bore — in the case of smoothbore or shotgun barrels — or on the smaller side if the finished barrels were to be rifled.

**DAMASCUS:** An early barrel steel made from strips of various steels welded together in a pleasing design. The harder metals resisted browning more than the milder ones, which accounted for the beautiful effect; but we vastly prefer a plainer and stronger barrel for actual shooting!

**DERRINGER:** A short-barreled pocket pistol of a general type and not particularly a gun made by Henry Deringer. The word, however, is now used to describe the type of small handgun; born through public recognition of a Deringer-built pistol used in the assassination of President Lincoln; the second 'r' was added to differentiate the two.

**DETENT:** A fly added to the tumbler when a set trigger is installed. This cams the sear nose to some extent during firing by missing the half-cock notch.

**DETONATING POWDERS:** Very powerful high explosives which are initiated by a blow, not requiring ignition. They made the percussion cap and modern primers possible. Alexander Forsyth developed the first practical detonator lock for firearms about 1805 and patented it in 1807, but it did not gain general acceptance for many years. Although mercury fulminate was already known, Forsyth refused to use it, preferring his mixture of potassium chlorate, charcoal and sulphur.

**DISC PRIMER:** During the transitional period appeared a Sharps rifle that self-primed for each shot. The rifle's hammer action caused a tiny magazine to place a disc-like primer over the nipple for each shot.

**DOG LOCK:** The manually operated hammer catch on many early snaphaunce and crude flintlocks.

**DOGHEAD:** The spring-loaded arm found on wheel locks to hold the pyrite against the rotating wheel.

**DOUBLE-ACTION:** The process of cocking the hammer, rotating the cylinder and firing the round with one single movement of the trigger to the rear; a double-action revolver also can be cocked and fired manually single action.

**DOUBLE-NECK HAMMER:** Reinforced hammers found on many later flintlock rifles, especially on military rifles that were built for hard use.

**DOUBLE RIFLE:** A popular side-by-side rifle that was used mainly for big-game hunting in Africa and India.

**DRIFT:** The lateral error in a bullet's flight due to its rotation from the rifling.

**DRIVELL:** An early term for a ramrod.

**DROP:** The distance from the line of sight to the top of the comb and the top of the heel of a stock.

**DUELLING PISTOL:** Usually a single-shot percussion or flintlock pistol of superb quality — Manton, Purdey, etc. Aristocrats, being as they were, often found it necessary to defend one's honor by placing a well-aimed bullet into (or near) their opponent.

**DUPLEX LOAD:** One in which a tiny priming charge of "bulk" smokeless shotgun powder is loaded ahead of a reduced charge of black powder for cleaner shooting, etc. Only for the thoroughly experienced shooter. Currently outlawed in many larger matches across the nation.

**ELEVATION:** Raising the rear sight raises the point of impact. Raising the front sight lowers it.

**EPROUVETTE:** A device in either flint or percussion by which the comparative strength of powder samples may be tested, usually by a rotating gauge and stationary needle. Not too accurate, but a peachy conversation piece.

**EROSION:** The enlargement of a bore, touchhole or nipple vent from the intense heat of ignition coupled with projectile wear. Reasonable loads increase barrel life.

**ESCUTCHEON:** The metal inlay through which the barrel key is inserted. This is reinforced for obvious reasons.

**FALSE MUZZLE:** Used to improve accuracy by preventing possible damage to the bullet, this device is placed on the muzzle of the finer target rifles as the bullet is started into the muzzle; this helps prevent possible damage to the crown of the muzzle also.

**FENCE:** Also known as the flash guard, this small projection located on the rear of a flintlock's flash pan diverts the flash of the igniting priming powder from the shooter's eyes; today's flintlock fancier would be wise to wear a pair of good shooting glasses in case the sparks and flame happen to bypass the diversion.

**FERGUSON RIFLE:** Early breechloading rifle perfected from earlier designs by British Major Patrick Ferguson. It consisted of a vertical screw through the breech, which was lowered by turning the trigger guard. This exposed the chamber and allowed the rifle to be loaded, first with a ball, and then with the powder. The rifle was used to a limited degree in the American Revolution where it met with moderate success.

**FINIAL:** The decorative ending lines of an inlayed patch box, trigger guard strap or most any other pieces of furniture; these ornate touches are usually what make truly one-of-a-kind guns.

**FLASH:** As the flint on a flintlock hammer strikes the hardened frizzen it results in minute sparks falling into the priming powder located in the flash pan. This ignites the powder and the result is an audible and visible flash that can cause the shooter to flinch.

**FLASH GUARD:** See fence.

**FLASH HOLE:** The small hole located on the side of the barrel near the flash pan. This hole serves as an entrance for the ignited powder in the pan to the main charge in the barrel.

**FLASH PAN:** Rifles and pistols that rely on the sparking of flint against steel for ignition have a small pan located below the frizzen or striking arm. A fine granulation of black powder — FFFFg — is placed in the pan; this serves as a primer for the main charge that is located in the chamber which is ignited by the flame that shoots down the flashhole leading from the flash pan.

**FLINT:** A hard quartz that will produce sparks when struck against steel. The spark-producing or igniting element in a flintlock firearm.

**FLINTLOCK:** The principal arm used during the late Seventeenth, Eighteenth and early Nineteenth Centuries; the first appeared in France around the end of the first quarter of the Seventeenth Century. It was the principal lock until the introduction of the percussion lock.

**FOREND:** Also called forearm. The portion of the wooden stock which lies under the barrel.

**FORESIGHT:** English term meaning front sight.

**FORE-STOCK:** Also known as the forearm and forend, the wooden area of a one-piece stock or the wooden section of a two-piece stock that lies under the barrel.

**FORSYTH LOCK:** The first successful percussion lock, designed and built by Reverend Alexander Forsyth, an amateur chemist from Scotland. Forsyth obtained a patent for his invention in April 1807, and the following year went into the commercial production of this lock — this actual manufacturing being supervised by his assistant, James Purdey.

**FOULING SHOT:** A first shot into the backstop to remove every vestige of oil before firing a match.

**FOWLING PIECE:** This was an early term used to describe a gun that was intended for use with a load of shot instead of a single solid projectile. With the exception of the type of shot used, these were loaded practically the same as today's reproduction muzzleloading shotguns. Early shot had been small cubes chopped from a strip of lead, not the well-formed spherical shape known today.

**FRENCH LOCK:** The earliest successful flintlock; this type of lock first appeared around Paris sometime about the end of the first quarter of the Seventeenth Century.

**FRESHENING:** The rejuvenation of a worn bore by deepening each groove, then smoothing the tops of the lands. This will generally require a new mold or enlargement of the former one's cavity. Simpler than either rerifling or sleeving, if your bore is not too far gone.

**FRIZZEN:** The hardened steel surface which the flint strikes to ignite the primed flashpan of a flintlock. Occasionally this may be referred to as the pan cover, steel, battery or by a similar term.

**FRIZZEN SPRING:** An external spring that controls the position of the frizzen, sometimes applying pressure on the frizzen to make better contact with the flint when the trigger is pulled.

**FULMINATE OF MERCURY:** An explosive priming charge used in the making of percussion caps. The discovery of fulminate of mercury — announced on March 13, 1800 — led to the invention of the percussion cap around 1820. Other detonating agents, such as fulminate of gold and silver, had been around since the 1600s, but had no practical use.

**FULMINATING POWDERS:** Detonating agents such as fulminate of gold and silver were discovered as early as 1600 but found no practical purpose. The discovery of fulminate of mercury was announced on March 13, 1800, leading to the invention of the percussion cap almost 20 years later.

**FURNITURE:** The metal trim found on muzzleloaders, usually made of brass or German silver; this trim is usually decorative and adds to the overall appearance of the gun.

**FUSIL:** A late 1600 military flintlock; this gun resembled a kind of French woodcock gun and is the reason why the English cavaliers referred to them as fusils or fusees — a French term meaning any nonmilitary sporting arm.

**GAIN TWIST:** Rifling of a bore that increases in the number of turns as it progresses toward the muzzle.

**GAUGE:** The size of a shotgun bore. This is determined by the number of spherical lead balls of the bore's diameter it takes to weigh exactly one pound. For example: a 20-gauge cylinder bore would weigh out twenty lead balls to the pound; the same with 16 gauge and 12 gauge, the number of lead balls to the pound equalling the bore size. This term also is used to describe various types of measuring devices.

**GERMAN RING TARGET:** A popular match ring target of the mid to late 1800s. This type of paper target was used extensively during the formal shooting matches of the Schuetzen era of the 1880s.

**GERMAN SILVER:** Another name used to describe nickel silver. An alloy of copper, zinc and nickel, its silver-white appearance makes it ideal for furniture on muzzleloaders.

**GLOBE SIGHT:** A fine front sight blade with an extremely small bead. This delicate sight is almost always shaded in a cylindrical tube.

**GOOSENECK HAMMER:** The type of hammer found on many beautiful early flint and percussion sporting arms. Unlike the thick and heavy hammers found on military arms, these hammers were slender in proportion and graceful in design.

**GROOVES:** The spiral channels cut in the rifling of a bore, the raised portions are known as the lands or flats. The lands and grooves of a rifle's bore make the bullet rotate during flight and are instrumental in a gun's accuracy.

**GROUP:** A good target group is a series of bullet holes in close proximity. Sight adjustments will then move future groups to the target's center.

**GUNFLINT:** High-quality flint shaped with a forward chisel edge, used for firing a flintlock.

**GUNPOWDER:** The propellant explosive used in small arms.

**HAIR TRIGGER:** The extremely light trigger pull of the front trigger on a set trigger mechanism. These usually are adjustable and many can be adjusted to the point that they will release at the slightest amount of pressure.

**HALF-COCK:** A safety position of the hammer on rifles and pistols; the half-cock position of revolvers allow the cylinder to be freely rotated for easier loading.

**HALF-STOCK RIFLE:** A term occasionally used to depict the mountain and plains rifles used by early westward traveling settlers or adventurers. These were built to withstand rugged use and the graceful lines of the Pennsylvania and Kentucky long rifles weren't usually found on these guns; this was also the gun of the famed mountain man.

**HAMMER:** The arm that strikes the detonating device on percussion and cartridge guns or the arm that contains the flint on flintlock guns. This part was known as the cock on earlier wheel-lock and flintlock guns.

**HAMMER SPUR:** The contoured protrusion found on the hammer of cartridge and percussion guns; on flintlocks, this appeared in the form of a part of the jaw that held the flint.

**HAND:** The part of a revolver's working mechanism that protrudes through the rear inside of the frame and turns the cylinder as the hammer is cocked or the trigger pulled on double-action revolvers.

**HAND CANNON:** The earliest form of a small arm; first used during the mid-1400s, although its origin is unknown and the exact date it was first introduced remains a mystery to historians. Nearly every force in Europe was using one form or another of this type of armament by the turn of the Sixteenth Century. Resembling a metal tube, the cannoneer ignited the loaded round by placing a touch to the exposed flashhole, which was extremely hard on the fingertips!

**HANDGUN:** Originally this term was used to describe all guns that were held by hand, later to depict only pistols and revolvers.

**HANG-FIRE:** A dangerous situation, a hang-fire actually is what appears to be a misfire but discharges after a short delay. Perhaps more common with flintlocks than percussion locks, it's good practice to keep the muzzle pointed downrange should an apparent misfire occur. Never place your face near the muzzle in case of such a situation, the delayed ignition could cause serious injury to you or anyone else unlucky enough to be in front of the muzzle.

**HEEL:** The rear top corner of the buttstock, the portion of the stock that is in conjunction with the top of the butt plate.

**HORSE PISTOL:** An early pistol used by horsemen; this large and chiefly military pistol was most often carried in a pommel holster.

**HUNTING POUCH:** The leather pouch, usually decorated, in which the early American rifleman carried patching, spare flints, priming horn and other accessories for his long rifle.

**HYDRAULIC BULLET:** A muzzleloading projectile drilled (from the front) to insert water after which the hole is plugged. This gives increased expansion on a solid target such as game.

**IGNITION:** The method used to fire the main charge in the breech; a number of different means have been used or tried in the past, among which are the slow match, wheel-lock pyrites, flintlock, percussion cap.

**INCISE:** To cut the surface of a stock to a certain depth in preparation to relief carving, inlaying, et al.

**INLAYS:** The decorative touches added to the stock of many rifles, these may either be of different woods, metal, ivory or just about anything the stock makers choose to use. These are finished flush with the surface of the stock; such inlays are the little extras that make a gun one-of-a-kind.

**INLETTING:** The precise removal of wood from the stock in preparation for the fitting of a lock, barrel or other parts that come into contact with the wood's surface and demand some removal.

**IRON PYRITES:** A common mineral, a yellowish metallic-looking sulfide. The "fool's gold" of the inexperienced prospector. Striking sparks from steel, it was the ignition agent of both the wheel lock and the pyrites lock.

**JAEGER RIFLE:** An early German arm from which our Kentucky rifle evolved, being drastically modified to suit New World conditions.

**JAG:** An accessory that fits into the end of the ramrod to aid in

cleaning the barrel; this is usually in the form of a buttonlike device that has serrated edges to grip the cleaning patch.

**KENTUCKY RIFLE:** A term mistakenly used in reference to the numerous long rifles, many of which were manufactured in other armsmaking states, such as Pennsylvania or North Carolina. Such rifles are traditionally long flintlocks that saw much use in the settling of what is now the state of Kentucky, in which armsmaking never reached the level as that found in several other states.

**KNAPPER:** A professional craftsman who chips out gunflints. This work is nearly all done with the aid of handtools, with perhaps the only mechanized help occuring during the mining of the flint. Today the only remaining professional knappers operate in the village of Brandon, England.

**LANDS:** The raised spiral ridges between the grooves of the rifling.

**LAP:** The process of smoothing out rough areas of a bore. This is most commonly done with the use of a lead bit or mandrel and various abrasive materials, such as diamond paste.

**LINEN:** This cloth material, woven from flax fibers, is one of the best patching materials.

**LINEN CARTRIDGE:** An early type of combustible cartridge where the wrapping material was made from nitrate-impregnated linen, rather than paper.

**LOADING BLOCK:** A wooden block that has been drilled with holes for carrying prepatched balls. To use, the hole in the block is aligned with the muzzle and with the use of a short starter the ball is seated into the muzzle. When carried hunting, a loading block saves a lot of time when loading succeeding shots and makes packing the round balls less tedious when it comes time to dig one out for loading.

**LOADING LEVER:** The lever that is attached underneath the barrel on the majority of the cap and ball revolvers, used to seat the balls over the charge of powder in the chambers.

**LOCK PLATE:** The metal base for the mechanism of a conventional muzzleloader's lock; all screws, pins, etc., are usually mounted to this.

**LOCK SCREW:** The screw that runs laterally through the stock to hold the lock in place.

**LONG RIFLE:** Actually the only true term that should be used to describe the type of rifle most common to this country during the period from the mid-1700s to the end of the second quarter of the Eighteenth Century. Many people erroneously refer to this type of rifle as a Kentucky Rifle, even though that same type could have been produced in Pennsylvania or North Carolina.

**MAGAZINE CAPPER:** A device used to dispense percussion caps directly onto the nipple. These are commonly spring-loaded and hold a quantity of percussion caps; the spring keeps the cap in line for jam-free feeding. To use, the percussion cap that is extending or appearing in the exit hole of the capper is placed over the nipple and a slight tug frees it from the capper. Such devices are most commonly used for loading cap and ball revolvers, eliminates fumbling for caps in pockets or removing them from the tin.

**MAINSPRING:** A heavy spring that controls the fall of the hammer. Early springs were commonly of the flat leaf type, later and improved springs appeared in the form of a V, some of today's modern black powder rifles utilize even superior coil springs.

**MAINSPRING VISE:** A clamp to compress the mainspring for easier disassembly of the lock mechanism.

**MATCHCORD:** Another term for the burning match of early matchlock guns.

**MATCHLOCK:** The earliest form of mechanical lock; first matchlocks required shooter to lever the match into touchhole, later versions mechanically struck match into primed flash pan.

**MATERIEL:** The equipment of the military. Not to be confused with the raw *material* from which it is made.

**METALLIC SIGHTS:** Any open, hooded or tube sight that does not rely on the magnification of the target through the use of precision-ground glass lenses.

**MINIE BALL OR BULLET:** Developed into its present state by Captain C.E. Minie of France in 1848, the Minie is an aerodynamically stable cylindrical ogive bullet with a hollow base. This bullet is easily seated in the dirtiest of bores, usually requiring very little effort. When fired, the expanding gases of the rapidly burning powder in turn expands the hollow base of the Minie into the rifling. Immortalized as the "minny ball" during the Civil War, the Minie-designed bullet made quick reloading in battle possible.

**MIQUELET:** Forerunner of the true flintlock, this type of lock followed the Dutch snaphaunce lock. The main improvement over the miquelet and the snaphaunce was that it featured a frizzen and pan cover that was combined into a single part; mainspring on this type of lock was located on the outside of the lock plate.

**MRT:** Mid-Range Trajectory; the curved flight of a bullet as measured halfway between the muzzle and the target or game.

**MISFIRE:** A state when the round loaded in the chamber fails to fire as the primer — powder in flash pan or percussion cap on the nipple — ignites. It is also possible to have a misfire as a direct cause of the primer not igniting.

**MULE EAR LOCK:** Percussion lock that features a flat side hammer that pivots horizontally.

**MUSKET:** The long, full-stocked shoulder guns used by early military forces. These were commonly smoothbore, those that featured rifled bores are referred to as rifled muskets. The soldier that carried one of these as his principle means of armament was known as a musketeer. A shortened carbine version of this type of arm is a musketoon.

**MUSKETOON:** A shorter shoulder arm of musket pattern between the infantry musket and cavalry carbine in length. Issued to artillery and sappers (military engineers).

**MUZZLE:** The end of the barrel opposite the breech; the point where the bullet, shot load, projectile leaves the barrel.

**MUZZLE ENERGY:** The amount of force exerted by the projectile as it leaves the muzzle; this is expressed in foot/pounds.

**MUZZLELOADER:** Gun loaded through the muzzle with an enclosed breech. To load, the powder is dropped in first, followed by the projectile, shot or ball, the lock then is primed and the gun is ready to fire. Commonly used to describe nearly all black powder guns that rely on percussion or flint ignition, although cap and ball revolvers aren't actually loaded through the muzzle.

**MUZZLE VELOCITY:** Speed of the projectile as it leaves the muzzle; usually measured in feet per second.

**NIPPLE:** On muzzleloading percussion guns, the small metal cone that the percussion cap is fitted to; flame from exploding cap is passed through hollow cavity of the nipple to the main charge of powder loaded in the chamber.

**NIPPLE WRENCH:** A tool that fits over the head of the nipple of a percussion gun to permit removal and replacement of a nipple.

**NOSE CAP:** The metal cap on the front end of a muzzleloader forend, particularly on a full-stock arm.

**OCTAGONAL BARREL:** An eight-sided barrel commonly found on many of the early muzzleloading rifles and a number of pistols and revolvers; once just as common as the round barrel.

**OGIVE:** The radius of the curve of a bullet nose, commonly expressed in calibers.

**OPEN SIGHTS:** Metallic sights that usually appear in the form of adjustable or fixed V-notch rear and fixed blade front sight.

**PAN:** The receptacle which holds the priming powder in the flintlock and previous ignition systems.

**PATCH BOX:** An inlaid lidded box that is found on some of the muzzleloading rifles, although an assortment of accessories now find their way into these, they were originally intended for carrying greased patches or tallow for lubricating patching material.

**PATCH CUTTER:** A circular cutter used for precutting patches; this is placed with the cutting edge down on a piece of suitable material

and rapped with a mallet, resulting in a perfectly circular patch. Often confused with a patch knife, which is a bladed instrument used to trim excess patch material from around the ball as it is being seated into the muzzle.

**PATCH KNIFE:** If you do not use precut patches, each is trimmed at the muzzle during loading with this extremely sharp knife.

**PATCHING:** Cloth used to form a gastight seal around the round ball loaded into a muzzleloading rifle or single-shot pistol; this also improves accuracy by engaging the rifling and causing the ball to rotate better as it leaves the muzzle and while in flight.

**PATENT BREECH:** Also called French breech. One in which the breech plug and nipple seat are cast in one block. This has an upturned hook on its rear which engages a slot in a separate upper tang. In a half-stock rifle, for example, one barrel key is pulled and the barrel lifts right out for convenience in cleaning or transporting.

**PATINA:** As a gun ages the stock takes on a mellow yellowish tint, this is patina. Too often the nimrod gun enthusiast tries feverishly to remove this and give the gun that new look; as with fine furniture, this is a mistake.

**PATTERN:** The spread of the pellets from a shotgun's barrel. The choke of a gun is best established by the percentage of pellets placed inside a thirty-inch circle from a distance of forty yards.

**PEPPERBOX:** A small repeating pistol of the mid-1800s, so named since its usual multibarrel appearance resembles a pepper shaker, or pepperbox.

**PERCUSSION:** The cap and ball, last type of muzzleloader before the advent of practical breechloaders.

**PERCUSSION CAP:** Small metallic cup containing a minute charge of fulminate of mercury; when placed on a nipple, the striking of the hammer causes the fulminating charge to explode which in turn ignites the powder in the chamber or breech.

**PICK:** Also called a picker. A fine steel wire to clean out a nipple vent or flintlock touchhole.

**PICKET BULLET:** An early conical bullet used in this country; the base of this bullet was the only area that was of bore size, tapering toward the nose, care had to be taken in loading to ensure that bullet was seated straight. Such loading problems are the reason that the bullet never became as popular as the Minie.

**PILL LOCK:** An early type of percussion lock; a small globule of fulminate was used in place of the percussion cap — which wasn't around when this lock first came out.

**PIN-FIRE:** An early cartridge ignition system; casting had small hole near the head of the brass, a percussion-type cap was inserted into this, followed by a small pin. The cartridge was loaded into the chamber, the pin and chamber walls holding the cap in place. The hammer struck the pin which ignited the percussion cap when fired.

**PIPES:** The short tubes on the underside of a muzzleloader for holding the ramrod.

**PISTOL:** A small, usually concealable and short-barreled handgun, generally not a term used to describe a revolver. Some sources claim that the term originated from the Italian gunmaking center of Pistoia, others claim the word was derived from a short Bohemian handgun known as the pist'ala; actually its origin remains unknown.

**PITCH:** Also called twist. The angle or speed of the rifling.

**PLAINS RIFLE:** With the westward migration, a shorter rifle was needed for loading on horseback, and heavier calibers for buffalo, etc. The famous Hawken rifles were usually half-stock plains rifles.

**POCKET PISTOL:** A general term used to depict nearly any small pistol or revolver that can be easily concealed. Certain short-barreled pistols that are actually pocket pistols became known as derringers after the assassination of President Lincoln with a Henry Deringer-made pocket pistol.

**POWDER FLASK:** Carrying container for powder, commonly made of metal having characteristics of copper and brass, but occasionally made from stag horn or like materials. Powder flasks usually have some type of charger mounted on top.

**POWDER HORN:** From our colonial period comes the powder container of cow or buffalo horn, more often used with a separate nonadjustable charge measure. Proper accessory with a flintlock.

**POWDER MEASURE:** Any of several types of device for dispensing powder, including dippers of specified volumetric capacity and adjustable rotary measures dispensing powder from a hopper or reservoir. The rotary type is suitable for use with smokeless (nitro) powders, but such measures never should be used for dispensing black powder because of the danger of setting off the black powder by means of a spark or friction.

**POWDER TESTER:** Also known as an eprouvett. A device for measuring the comparative strength of powders. The ignition of the powder registers on some sort of needle or gauge — there were various types — and depending on the strength of powder being tested, the needle or whatever was used to measure the burning force would register. As a rule such devices weren't very reliable.

**PRICKER OR VENT PICK:** A piece of fine wire used to clear the vent of a nipple or flashhole, on a flintlock, of foulings or obstructions.

**PRIMER:** On some percussion bench rifles, a special attachment permits ignition by a modern primer instead of an ordinary cap.

**PRIMING POWDER:** The finer powder (usually FFFFg) in a flintlock's pan.

**PRIMING HORN:** A miniature horn for FFFFg priming powder.

**PROJECTILE:** The ball or bullet shot from a firearm.

**PROOF MARKS:** Tiny stampings in a barrel's surface to signify that it has been proof fired with a prescribed overload under government supervision as a safety measure.

**PROPELLANT, PROPELLENT:** Stumbling block of many a writer. The first is the noun; the second is the adjective. Example: For the propellant we use a propellent powder. A "low" explosive suitable for gunpowder.

**PULL:** The measurement from the firing trigger to the center of the butt plate.

**PUNT GUN:** A large-bore shotgun mounted on the prow of a boat (punt) and used for waterfowl market hunting, because of its ability to down large numbers of birds at a single shot.

**PYRITES:** Commonly known as fool's gold, this material actually is iron pyrite; when struck against a hardened-steel surface it results in sparks. Early wheel-locks and later early versions of the flintlock relied upon this principle for ignition.

**PYRITES LOCK:** An improvement over a matchlock, in which iron pyrites fell against a steel frizzen. It had the manually operated pan cover of the matchlock and the outside mechanism of the later miquelet.

**QUEEN ANNE PISTOL:** A screw barrel breechloading style flintlock pistol commonly found in England during the early 1700s; pistols of this design lacked forends.

**RAMROD:** Usually made of wood, although brass and steel ones aren't uncommon. A rod that is used to seat the ball over the powder charge in muzzleloading rifles. Ramrods are commonly carried under the barrel, held by ramrod pipes or thimbles.

**REENTRY MATCH:** One in which the shooter is allowed to fire more than one score for record.

**REVOLVER:** A multishot handgun, using a revolving cylinder to align the chambers with the barrel.

**REVOLVING RIFLE:** The perfection of the cap and ball revolvers and the noticeable need for a repeating rifle resulted in a combination of the two, a revolving rifle. This gun sported nearly the same mechanism as the revolver, but had a longer barrel and rifle-like butt stock. Remington and Colt were the chief producers of these during the mid-1800s.

**RIB:** The strip of steel above the joint between the barrels in a side-by-side double gun or rifle.

**RIFLE:** A shoulder firearm designed to fire a single projectile and with grooves cut in its bore.

**RIFLE SAW:** A short, file-like cutter at the end of a wooden rod. Drawn through a barrel and mechanically guided in a spiral motion, this cuts the rifling grooves one at a time.

**RIFLED MUSKET:** Occasionally a thin-barreled musket was

produced that featured a rifled bore. Erroneously these sometimes are referred to as rifles when actually they are rifled muskets; rifles have much thicker barrel walls.

**RIFLING:** The spiral grooves in a rifle's bore which improve accuracy by imparting a spin to the projectile.

**SALTPETER:** Potassium nitrate, used in the production of black powder.

**SCHNABEL:** Often misspelled and commonly referred to as a nose cap; the metal cap found on the front of most muzzleloading rifle forearms, especially on guns featuring a full stock.

**SCREW BARREL PISTOL:** A breechloading black powder pistol that required the barrel to be unthreaded from its specially designed breech plug in order for it to be loaded. Pistols of this design were most common during the first half of the Eighteenth Century.

**SEAR:** The lock part — usually in the form of a notch — that is engaged by the tumbler and hammer until it is released by exerting pressure on the trigger.

**SEAR SPRING:** The small spring which actuates the sear.

**SELF-COCKING REVOLVER:** A forerunner to the first true double-action revolvers; this type of revolver was developed by London gunmaker Robert Adams during the early 1850s. Unlike the true double-action, it had no provision for manually cocking the hammer back, but instead relied upon trigger action to work the hammer and rotate the cylinder.

**SERPENTINE POWDER:** The crude first black powders, since corning powder into grains was discovered later, this first powder appeared in the form of meal.

**SET TRIGGER:** A double-trigger mechanism in which the rear trigger is first pulled to set up the front trigger so that it can be released with a very slight amount of pressure. This type of trigger usually is found on target rifles and occasionally on the finer hunting rifles.

**SHOT:** Small spherical balls commonly used in a shotgun load; these range in size from .33-inch diameter — 00 buck — to .04-inch diameter — dust shot. Occasionally the larger shot may be used to load smaller bore rifles and pistols, but in general use shot is loaded in given quantities — the smaller the shot, the increase in the number of projectiles — in shotguns.

**SHOT DIPPER:** A graduated measure on a wooden handle for measuring one charge of bird shot.

**SHOT POUCH:** A container, most often made of leather, used for carrying shot.

**SHOOTING BENCH:** A solid bench for shooting a rifle from a rest.

**SHORT STARTER:** A short, five to six-inch rod fitted with a round or flat palm-fitting handle used for starting patched balls down the muzzle of rifles and some pistols.

**SIDE PLATES:** Plates on each side of a patch-box cover.

**SIGHTING SHOT:** A nonscoring shot at the beginning of a match to "get the range" dope with the wind, adjust sights, etc.

**SINGLE-ACTION:** A revolver which must be manually cocked for each shot.

**SIZING:** An additive to certain cloth materials to give them "body." Must be washed out before using as patching.

**SKIN CARTRIDGE:** An advanced combustible cartridge; propellant is encased in nitrated animal intestine. This cartridge was introduced by Captain John Hayes in 1856.

**SLING:** The leather or web strap on a military musket or rifle. Now used as an aid in aiming but formerly only as a help in carrying the pieces on a long march.

**SLING SWIVELS:** Two metal loops on a shoulder arm to which a sling may be attached.

**SLUG GUN:** Term used to denote an extremely heavy-barreled match gun; slug gun shooters may spend as much as ten to fifteen minutes to load their guns, meticulously checking and rechecking every loading step.

**SMOOTHBORE:** Any small-arm or artillery piece, the bore of which is not rifled.

**SNAIL:** The water drain type of base for a percussion nipple often seen on higher-grade guns instead of a drum.

**SNAPHAUNCE:** Early forerunner to the flintlock; frizzen and flash pan cover were two separate parts.

**SPANNER:** Key or wrench-like device used to cock or span a wheel-lock.

**SPERM OIL:** The oil extracted from the flesh of the sperm whale. Among its many uses it once was a favorite gun lube.

**SPOTTING SCOPE:** A small telescope, usually 20 power, used for examining the target from the firing point.

**SPRING, FLAT OR KICK:** The original type of spring used in early firearms.

**SPRING, HELICAL:** A coil spring, not to be confused with a spiral spring.

**SPRUE:** The small flat on one side of a cast ball where excess lead was removed by the cut-off plate.

**SPUR TRIGGER GUARD:** One with a hook on its lower side to support the second finger and give better control of a hair trigger.

**STARTER:** A short wooden rod for placing the ball partway down the bore before using the ramrod.

**STEADY PIN:** The little knob on the edge of a flat mainspring which fits into a slot in the lock plate.

**STEEL:** The hardened surface of the frizzen that causes spark when struck by the flint on a flintlock; on some early locks it was a strip of hardened metal that was attached to the pan cover to cause the spark for igniting the primed flash pan.

**STIRRUP:** The pivoting piece connecting mainspring to tumbler in some locks.

**STOCK:** The main wooden portion of a firearm, especially a shoulder arm.

**STRAIGHT BARREL:** A barrel on which the outside diameter remains the same its entire length; barrels that gradually decreased in outside diameter to the muzzle are known as tapered barrels; barrels that taper toward the middle then return to the original diameter at the muzzle are known as tapered and flared barrels.

**STRIKING A BARREL:** The lengthwise finish draw-filing of a barrel's exterior, especially an octagonal barrel, with a special double-handed striking file.

**STRING MEASURE:** The pioneer-scoring method in which wooden plugs were inserted in each bullet hole, a string drawn around all and measured. The shortest string won. Through the years, there have been several variations of this, some involving the center and some only measuring group size. Today, "string measure" is done from the center with calipers and the distances totaled.

**SUPERIMPOSED ROUNDS:** Among the first repeating smallarms appeared ingeniously designed guns that featured two or more locks located at intervals along the rear area of the barrel. These then were loaded one round on top of another, the powder charge of each shot coinciding with the lock that was to fire that round, the lead ball sealing the flame of the first round from igniting the one directly behind it — hopefully. Care surely had to be taken not to fire the last round first! Such guns appeared as early as the Sixteenth Century.

**SUPERPOSED RIFLES:** Double-barreled (over/under) rifles, one barrel over the other. The barrels of many early ones pivoted upon a longitudinal axis so that one lock would fire whichever barrel was uppermost.

**SWAGING:** The precision sizing of a conical bullet to bring it to an exact size; done with the aid of precision tools.

**SWIVEL BREECH:** Another approach to multiple-shot capability, in which two superimposed barrels are rotated in turn to align with

a common lock mechanism, providing a relatively quick second shot when both are loaded with powder and ball.

**TANG:** Most often an extension from the breech plug, the tang is the retainer for the long screw that runs vertically through the stock, holding the breech portion of the barrel securely in place. The screw that holds this in place is known as the tang screw, which commonly fastens to the trigger assembly and helps hold it in place also.

**TANG SIGHT:** A rear sight aperture that attaches to the barrel tang; commonly a folding type that allows the usage of regular open sights.

**TAPE PRIMER:** A strip or roll of paper tape that has small charges of fulminating powders attached to it; designed for use with specially modified rifles during the Civil War.

**TENON:** The metal loop or flat piece of metal that extends from the bottom of the barrel which engages the barrel key or pin that holds the barrel to the stock.

**THIMBLE:** The metal ferrules located along the ramrod channel or under the barrel for storing and carrying the ramrod.

**TINDER:** A highly flammable substance, such as flax tow or charred linen, used to catch sparks to start a fire. The pioneer used the mechanism of his flintlock to ignite his tinder in camp.

**TOE:** The rear bottom point of the butt stock; the area of the stock located at the bottom of the butt plate. Occasionally a rifle will have a metal plate running along the bottom of the butt stock. This is the toe plate; most commonly found on Kentucky-type rifles.

**TOE PLATE:** The metal strip on the bottom of a Kentucky rifle butt next to the butt plate.

**TOMPION:** Plug used to prevent dust and moisture from getting into a muzzleloader's barrel during storage.

**TOP JAW:** The upper area of a flintlock's hammer that holds the flint; the screw that forms the vise that holds the flint is the top jaw screw.

**TOP JAW SCREW:** The heavy screw which clamps the flint in position.

**TOUCHHOLE:** The vent through which a flintlock pan transmits its flash to the main charge.

**TOW:** Unspun flax, an early patching material for shotguns and often used as cleaning patches for rifles; coarse fibers made it undesirable for patching round balls in rifles or pistols.

**TOWER LOCK:** The type of flintlock found on the Brown Bess; locks are usually stamped with a crown and the initials GR on the area of the lock plate that is located in front of the hammer and the date of manufacture and the word Tower to the rear of it. Locks of this type were being installed first on Brown Bess muskets at the turn of the Eighteenth Century; occasionally a lock of this type is found on various muskets and fowling pieces.

**TRAJECTORY:** The vertical curve of a bullet's flight.

**TRAP:** A shotgun contest on aerial targets, usually breakable clay pigeons. Also the instrument which projects these targets into the air.

**TRIGGER:** The small lever by which a firearm is fired. Originally "tricker" because it did the trick.

**TRIGGER GUARD:** The metal bow which guards against accidental trippings of the trigger.

**TRIGGER PLATE:** A metal strap set into the bottom of the stock to control lateral motion of the trigger. Sometimes trigger assembly is attached to it, sometimes not.

**TRIGGER SPRING:** A small spring which returns the trigger to its forward position.

**TUBE LOCK:** An early percussion-type lock; to fire, a small copper tube five-eighths-inch in length and a sixteenth-inch in diameter — filled with percussion powder — was inserted into the vent hole. All but about an eighth of the tube went into the hole, the remainder rested on a small anvil-shaped piece of metal. The hammer striking this would ignite the powder inside the tube, which in turn ignited the charge in the chamber.

**TUBE SIGHT:** Ancestor of the telescope sight. A long, thin metal tube, often full length of the barrel, not containing optical lenses. With rear aperture and front pin-head, it allowed maximum definition of the sight picture.

**TUMBLER:** The central piece of a conventional lock that turns with the hammer; contains the half-cock and full-cock notches as well as the detent if the lock has one.

**TWIST:** The pitch or angle of spiral of the rifling grooves. 360-degree turn of rifling in length expressed in inches, 1-14", etc.

**UNDERHAMMER LOCK:** An ignition system for percussion arms that features a hammer suspended underneath the barrel, which pivots upward to engage the cap and nipple. The design permits a slimmer carrying or concealment receptacle since the barrel line is unbroken by the hammer extension.

**UNDERHAMMER STRIKER:** A percussion-type lock that features the hammer underneath; as on some of the modern-made underhammer muzzleloaders, the trigger guard doubles as the spring to power the striking of the hammer.

**UNDERRIB:** The metal rib running beneath the barrel on a half-stock rifle; supports the thimbles for the ramrod.

**UNDERSTRIKER LOCK:** A percussion lock with the hammer underneath, often with the mainspring serving as the trigger guard.

**UPPER TANG:** An extension of the breech plug which is held in the small of the stock by a screw.

**V-SPRING:** A flat V-shaped spring considered superior to an ordinary single-leaf spring.

**VENT:** The small hole on muzzleloaders through which the priming flame reaches and ignites the main charge.

**VENT PICK:** A small pin-like device used to clear the vent of a muzzleloader or the touch hole of a cannon of any foreign material. On percussion arms, this pin is called a nipple pick.

**VERNIER SIGHT:** A precision rear aperture commonly found on target rifles of the 1800s.

**WADCUTTER:** Nearly identical to a patch cutter, a small handtool featuring a circular cutting edge. By placing this edge onto wadding material and hitting the handle with a mallet, a perfect circular wad is punched out. This tool also can be used to cut patches for small rifles.

**WHEEL-LOCK:** The lock that made the first pistols practical; ignition relies upon the sparks created by the iron pyrites held in the cock coming into contact with the serrated edge of a rotating wheel. The first wheel-locks were introduced during the first quarter of the Sixteenth Century.

**WINDAGE:** A term used to describe any lateral adjustment made to the rear sight.

**WIPING ROD:** A separate rod used to wipe the bore clean of powder fouling between shots.

**WORM:** A corkscrew-type device used to remove a cleaning patch stuck in the bore of a muzzleloading rifle or removal of a shotgun wad; screws into the threaded tip of a cleaning rod.

**WRIST:** The small of the stock; the portion of the stock that forms the grip.

**ZERO:** The ideal sight setting at a given range from which adjustments will be made to meet varying conditions of light, wind, etc.

**ZOUAVE:** Originally French Algerian troops noted for their flamboyant costumes, consisting of multicolored baggy trousers, short belaced jackets, and fancy turban headgear. Their garb was copied by other armies, and was very popular during the early part of the American Civil War. In recent years, it has become the nickname for the Remington M1863 rifle because of this arm's supposed connection with Zouave regiments. There is no evidence, however, that the M1863 was preferred or used by these units.

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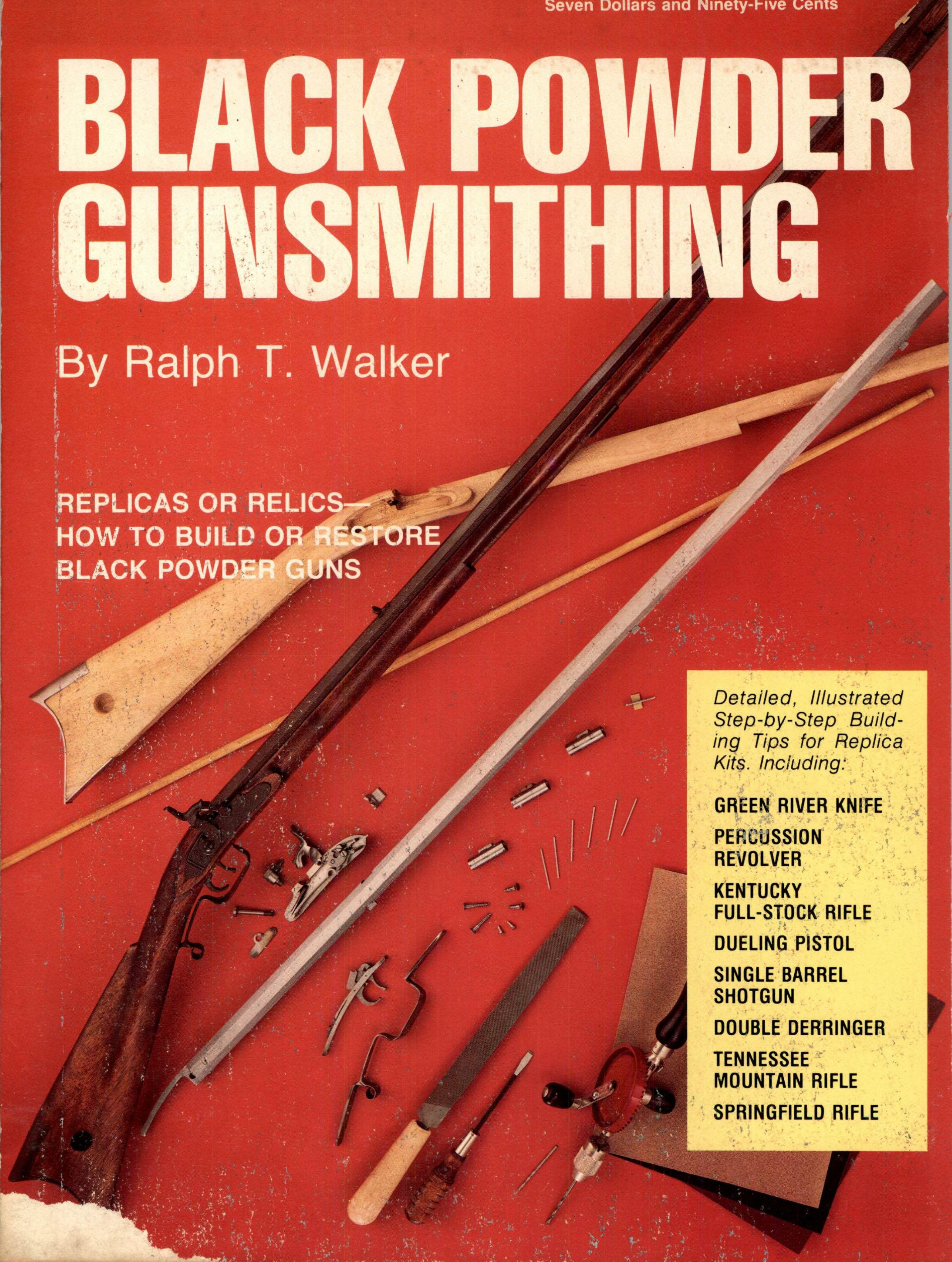

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